Conference proceedings of the Design Management Academy
Research Perspectives on Creative Intersections

edited by
Erik Bohemia
Cees de Bont
Lisbeth Svengren Holm
Founded in 1966 the Design Research Society (DRS) is a learned society committed to promoting and developing design research. It is the longest established, multi-disciplinary worldwide society for the design research community and aims to promote the study of and research into the process of designing in all its many fields.

The Design Society is an international non-governmental, non-profit making organisation whose members share a common interest in design. It strives to contribute to a broad and established understanding of all aspects of design, and to promote the use of results and knowledge for the good of humanity.

The Design Society is a charitable body, registered in Scotland, No: SC031694
**DMA 2017 Committees**

**Conference Chairs**
Erik Bohemia, Loughborough University, United Kingdom  
Cees de Bont, Hong Kong Polytechnic University, Hong Kong  
Lisbeth Svengren Holm, University of Gothenburg, Sweden

**Workshops Chairs**
Katinka Bergema, TU Delft, Netherlands  
Nuša Fain, University of Strathclyde, United Kingdom  
Oriana Haselwanter, University of Gothenburg, Sweden  
Sylvia Xihui Liu, Hong Kong Polytechnic University, Hong Kong  
Sharon Prendeville, Loughborough University, United Kingdom  
Ida Telalbasic, Loughborough University, United Kingdom

**PhD Seminar Chairs**
Jun Cai, Tsinghua University, China  
Sylvia Xihui Liu, Hong Kong Polytechnic University, Hong Kong

**Local Organising Team**
Cees de Bont, Chair  
Rennie Kan, Firefighter  
Sylvia Xihui Liu, Mainland Liaison  
Pierre Tam, Conference Secretary  
Jason Liu, Visual Communication  
Jörn Bühring, Conference Experience  
Rio Afa, IT  
Flora Afa Chan, Registration

**International Scientific Programme Committee**
Erik Bohemia, Loughborough University London, United Kingdom  
Cees de Bont, The Hong Kong Polytechnic University, HK  
Brigitte Borja de Mozota, Designence, France  
Sam Bucolo, University Technology Sydney, Australia  
Jörn Bühring, Hong Kong Polytechnic University, Hong Kong  
Stuart Candy, OCAD, Canada  
Cabirio Cautela, Politecnico di Milano, Italy  
Giulia Calabretta, Delft University of Technology, Netherlands  
Mark Clark, American University, USA  
Alice Comi, Kingston University, United Kingdom  
Fleur Deken, VU University Amsterdam, Netherlands  
Claudio Dell’Era, Politecnico di Milano, Italy  
Luh Dingbang, National Cheng Kung University, Taiwan  
Kees Dorst, University of Technology Sydney, Australia  
Magnus Eneberg, Business & Design Lab, Sweden  
Martyn Evans, Manchester Metropolitan University, United Kingdom  
Nuša Fain, University of Strathclyde, United Kingdom  
Hu Fei, Guangzhou Technology University, China  
Fan Fei, Tongji University, China  
Gorm Gabrielsen, Copenhagen Business School, Denmark  
Gerda Gemser, RMIT University, Australia  
Daniel Graff, Loughborough University London, United Kingdom  
Selena Griffith, University of New South Wales, Australia
International Board of Reviewers
Rita Assoreira Almendra, University of Lisbon, Faculty of Architecture, Portugal
Mauricio Moreira e Silva Bernardes, Federal University of Rio Grande do Sul, Brazil
Kathryn Best, Kathryn Best, United Kingdom
Erik Bohemia, Loughborough University, London, United Kingdom
Afonso Nuno Borges, Universidade da Beira Interior, Portugal
Brigitte Borja de Mozota, Designence, France
Jennifer Bratherton, Regent's University London, United Kingdom
Sarah Brooke Brooks, U.S. Department of Veterans Affairs, United States
Kaja Tooming Buchanan, Tongji University, College of Design and Innovation, United States
Sam Buco, University Technology Sydney, Australia
Jörn Bühring, Hong Kong Polytechnic University, Hong Kong
Kathryn Burns, Birmingham City University, United Kingdom
Jun Cai, Tsinghua University, China
Giulia Calabretta, Delft University of Technology, Netherlands
Robert Ian Campbell, Loughborough University, United Kingdom
Elena Caratti, Politecnico di Milano, Italy
Cabirio Cautela, Politecnico di Milano, Italy
Henri Hubertus Christiaans, UNIST, South Korea
Matteo Ciastellardi, Politecnico di Milano, Italy
Mark Clark, American University, United States
Alice Comi, Kingston University London, United Kingdom
Rachel Cooper, Lancaster University, United Kingdom
Wim Coreynen, Antwerp Management School, Belgium
Alexandra Lara Crosby, UTS, Australia
Cees de Bont, Hong Kong Polytechnic University, Hong Kong
Rudi de Lange, Tshwane University of Technology, South Africa
Christine de Lille, TU Delft, Netherlands
Julio Carlos de Souza van der Linden, Federal University of Rio Grande do Sul, Brazil
Robert DeFillippi, Suffolk University, United States
Fleur Deken, VU University Amsterdam, Netherlands
Claudio Dell’Era, Politecnico di Milano, Italy
Gaurang Desai, American University of Sharjah, United Arab Emirates
Ivo Dewit, University of Antwerp, Belgium
Kees Dorst, University of Technology Sydney, Australia
Carlos Alberto Duarte, IADE/ Universidade Europeia, Portugal
Nabil el Hilali, ESCA Business School Casablanca, Morocco
John Ensor, Edinburgh Napier University, United Kingdom
Özlem Er, Istanbul Technical University, Turkey
Ozgur Eris, The MITRE Corporation, United States
Mark Evans, Loughborough University, United Kingdom
Nuşa Fain, University of Strathclyde, United Kingdom
Fan Fei, Tongji University, China
Georgina Louise Follett, University of Dundee, United Kingdom
Gorm Gabrielsen, Copenhagen Business School, Denmark
Gerda Gemser, RMIT University, Australia
Juliana Goga-Cooke, CCO Gconsultancy Innovation, United Kingdom
Miaosen Gong, Jiangnan University, China
Daniel Graff, Loughborough University London, United Kingdom
Selena Griffith, University of New South Wales, Australia
Calin Gurau, Montpellier Business School, France
Adrian Haberberg, Independent, United Kingdom
David Hands, Lancaster University, United Kingdom
Michael Andrew Hann, University of Leeds, United Kingdom
# Table of Contents

**Editorial: Research Perspectives on Creative Intersections** .......................................................... vii  
DE BONT Cees; HOLM Lisbeth Svengren and BOHEMIA Erik

– Volume 1 –

**Keynote: Beyond Better Solutions: Design Thinking as a Social Technology** ...........................1
LIEDTKA Jeanne

**Theme 1. New Models of Innovation**

Section 1.a

Introduction: The Interplay between Science, Technology and Design ........................................ 19  
CAUTELA Cabirio; DELL’ERA Claudio; MAGISTRETTI Stefano; ÖBERG Åsa and VERGANTI Roberto

Bio-inspired Design: Explicating the Value of Bio-Inspiration ..................................................... 23  
GARBUIO Massimo; MAZZOLENI Ilaria and EISENBART Boris

Managing technology development: A two-steps process to discover new meanings .................. 43  
MAGISTRETTI Stefano; DELL’ERA Claudio; ÖBERG Åsa; and VERGANTI Roberto

Interdisciplinary View on Design Education ...................................................................................... 59  
WANG Xueying

Influence of design to implement a thermographic device for preventing diabetic foot ulceration 73  
AVILA-MORENO Monica; VALENCIA-HERNANDEZ Jose Omar and MORALES-HERNANDEZ Luis Alberto

The Impact of Collaborative Design on New Product Development: An Empirical Study of B2B E- 
Commerce Project in Taiwan .............................................................................................................. 91  
CHANG Kuo-pin

Section 1.b

Introduction: Interdisciplinary Perspectives and Trends in Open Innovation ................................. 109  
WAGNER Beverly and FAIN Nuša

The Smart Art Market Products from the Contemporary Art World: A Case Study of Specific  
Exhibition from Taipei ....................................................................................................................... 113  
FU Jia and LIN Pang-Suong

Mapping coupled open innovation processes from Activity Theory framework ............................ 127  
CANIK Yasemin; BOHEMIA Erik and TELALBASIC Ida

Bespoke Innovation: filling the gap between the classic and user-centred open innovation ........ 147  
FAIN Nuša; WAGNER Beverly; KAY Niel and VUKASINOVIC Nikola

Section 1.d

Introduction: Design Creating Value at Intersections ...................................................................... 157  
SVENGREN HOLM Lisbeth; KORIA Mikko; JEVNAKER Birgit and RIEPLE Alison

Design Thinking in Business Strategy: Applications in Human Resource and Pricing .................. 161  
JALOTE-PAMAR Ashis; BADJOKO Baydhir and DESHMUKH Sandeep

Cognitive Study of Products’ User Interfaces for Use by Elderly People ........................................ 179  
WANG Chun and CHEN Li-Hao

Design strategies for exploring and bridging: Intersections of everyday life and decision-making for  
sustainability ...................................................................................................................................... 189  
HESSELGREN Mia; HASSELQVIST Hanna and SOPJANI Liridona

Effects of atmospheric variables on children during shopping activity: a conceptual framework of  
children shopping experience .......................................................................................................... 207  
RUSMAN Mohd Shahril; YIN Yuanyuan and DHILLON Yasmin Sekhon

Enhanced Capabilities through Design-Based Approaches ............................................................. 223  
VAN DER MAREL Floris and JOORE Peter

Gamification of the Customer Journey at a Ski Resort ................................................................. 247  
IHAMÄKI, Pirita and HELJAKKA Katriina
Design, Collaboration & Evolvability: A Conversation About the Future .................................................. 261
BEST Kathryn and KORIA Mikko

Design emergence in Morocco as an African country: a pending institutionalization.................. 277
EL HILALI Nabil

The shaping of dissonance in craft-based innovation - exploring the combinations of novelty and tradition .................................................................................................................................. 293
HOLMQUIST Anna; MAGNUSSON Mats and LIVHOLTS Mona

The para-disciplinary role of Design transforming innovation in organisations .................. 305
YOUNG Robert; LIEVESLEY Matthew; O’LEARY David and WARWICK Laura

NPD, Design and Management for SME’s .......................................................... 325
FORD Peter and TERRIS David

Section 1.e

To Create More Vivid Experience: Information Generation and Dissemination by Display Design in Urban Planning Halls .......................................................... 345
XIU CHUAN He and XI PING Shi

Design processes for OBM firms in the NPD process .................................................. 359
CHOI Youngok; DE VERE Ian and CHOO Youngeun

A study of practice based design research models from knowledge integration perspective ...... 381
LI Honghai and CAI Jun

– Volume 2 –

Theme 2: Product-Service Systems

Section 2.a

Introduction: Capturing Value and Scalability in Product-Service System Design .................. 397
SUNG Tung-Jung; YUAN Soe-Tsy and YUAN Lu

On the Service Design of the Restaurant Queuing System in the Business Circle ............ 399
JI Hao and JANG Wansok

Applying Value-based design to lead technology innovation towards PSS development: A case study of FamiCare in ITRI .......................................................... 415
Wu Chih-Shiang (Mike) and Sung Tung-Jung (David)

PSS and Innovation of Meaning. ................................................................................. 433
GOTO Satoru

Co-creating product-service-system with and for the ageing society in different socio cultural contexts ............................................................................................................. 451
LU Yuan; VALK Carlijn; STEENBAKKERS Jim; BEKKER Tilde; PROCTOR Gavin; TOSHINIWAL Omna and VISSE Thomas

A prelude for PSS, practice consolidating theory ..................................................... 471
DEWIT Ivo and MATTHYSSENS Paul

Section 2.b

Recognizing readiness in manufacturing firms ..................................................................... 487
TESO Giulia and WALTERS Andrew T.

Product Service System Design Research of B2C Carsharing Based on Beijing .................... 509
YING Zhao and GUANZHONG Liu

Theme 3: Policy Making

Introduction: Creative Intersection of Policies and Design Management ...................... 523
JUNGINGER Sabine and TERREY Nina

Why Chinese Industrial Designers Oppose Vocational Qualification Certification? ....... 529
LIU Xiaojian; JIANG Yingying and SUN Yan

Managing Design IP in the UK — does the end justify the means? .......................... 539
HILLNER Matthias
Design IP legislation in the UK — an opportunity to innovate?............................................. 563
HILLNER Matthias

Design Policy Driven Development of Chinese Industry: The Experience from Guangdong Province
........................................................................................................................................ 595
HU Fei; ZHOU Kun; ZHOU Hongshi and Gong Jingsi

User-Involved Design for Direct Citizen Participation in Policymaking: Adaptive Values, Adaptive
Conditions and Common Ground ......................................................................................... 613
KIM Chorong; KWON Yeunyoung and NAM Ki-Young

Research on the development of cultural and creative products in Hubei Provincial Museum .... 631
PENG Hong and ZHANG Wei

– Volume 3 –

Theme 4: Intersecting Perspective

Section 4.a

KAYGAN Pinar; PIZZOCARO Silvia; HARMAN Kerry and BOHEMIA Erik

Design for circular futures through distributed repair ...................................................... 653
SALVIA Giuseppe and PRENDEVILLE Sharon

Exploring Consumers’ Trust Difference between Shopping on Website and Mobile App Service
Process .................................................................................................................................. 675
Chang Tsai Ping and Cheng Pei-Jung

Tracing the tensions surrounding understandings of agency and knowledge in technology design
........................................................................................................................................ 695
NEUBAUER Ruth, BOHEMIA Erik and HARMAN Kerry

FREE Architecture: An ethnographic approach to architecture practice .......................... 711
SANCHEZ Claudia and CORENO Victor

Managing emotion for a sustainable future .................................................................... 733
SHIGEMOTO Yuuki

The what, how and who of social service design ............................................................... 753
VAN DER BJIL-BROUWER Mieke

Together we do not forget: Co-designing with people living with dementia towards a design for
social inclusion ..................................................................................................................... 767
WINTERMANS M.C.; BRANKAERT R.G.A. and LU Y

Using collaborative reflection in service design research ............................................. 783
KOPRIE Merlijn and MANDAL Soumava

The role of inner values to teamwork during design for social innovation .................. 801
VYAS Pratik and YOUNG Robert

Design practices: Where is the sense in that?................................................................. 819
DOMINGUES Felipe; ZINGALE Salvatore and DE MORAES Dijon

Exploring articulations of Design Activism ................................................................... 843
ZAIZON Noémi; BOHEMIA Erik and PRENDEVILLE Sharon

Section 4.b

Introduction: Challenges and Obstacles to the Enactment of an Outside-In Perspective: The Case of
Design ................................................................................................................................... 867
GLORIA Moss; DE BONT Cees; SPRINGER Paul and HORVATH Gabor

The impact of gender on children’s design preferences ................................................ 869
MOSS Gloria Anne; HORVATH Gabor and VASS Eszter

People as an essential tool for considering ethics in the product lifecycle .................. 889
JAMES Alana and AFTAB Mersha
Section 4.c

Introduction: At the Intersection Social Innovation and Philosophy ................................................................. 911
TASSINARI Virginia

Social Design for Services Framework: Capturing Service Design for Development Framework... 917
MIETTINEN Satu and SARANTOU Melanie

Objects of Design: Activity Theory as an analytical framework for Design and Social Innovation 931
TJAHJA Cyril; YEE Joyce and AFTAB Mersha

Thoughts and reflections on design wisdom: a cross-disciplinary path towards social innovation ................................................................. 949
TAPIA OLmos Eduardo

Designing Good(s)? Exploring the Politics of Social Design Processes ................................................................. 961
VINK Josina; WETTER-EDMAN Katarina and RODRIGUES Vanessa

Theme 5: Methods

Section 5.a

Introduction: Design practices for effective strategic design .............................................................................. 983
GEMSER Gerda; CALABRETTA Giulia; KARPEN Ingo and DEKEN Fleur

Designers as Innovators in Organizational Contexts: A Proposal for a Typology ................................. 987
SVENGREN HOLM Lisbeth; AINAMO Antti and VILDINGE Christina

How design practices assist new venture teams in creating entrepreneurial opportunities ...... 1003
KLENNER Nico Florian; GEMSER Gerda and KARPEN Ingo

From Design Management to Strategic Design Management: Triggers, Enablers and Challenges in Building Strategic Design Management Capabilities................................................................. 1019
TOPALOGLU Fulden and ER Özlem

Building Design-led Ambidexterity in Big Companies ................................................................. 1043
STOIMENOVA Niya and DE LILLE Christine

The role of service design practices in enabling and embedding the servitization transition ..... 1061
CALABRETTA Giulia; DE LILLE Christine and BECK Caroline

Section 5.b

A smart home system is like a “Mother”! --- The effects of product metaphor on consumers’ comprehension of really new products (RNPs)................................................................. 1079
CHENG Peiyao; MUGGE Ruth and DE BONT Cees

Using proximity in sustainable product design .............................................................................. 1095
MAGNIER Lise; MUGGE Ruth and SCHOORMANS Jan

Section 5.c

Introduction: Foresight by Design: Dealing with uncertainty in Design Innovation ................................. 1111
BUHRING Jorn; BUCOLO Sam and JONES Peter

Design-inspired Foresight: Strategic foresight techniques for preferable futures ................................. 1115
BUHRING Jorn H

Design-led innovation and sensemaking: opportunities to connect................................................................. 1131
PRICE Rebecca; WRIGLEY Cara and MATTHEWS Judy

Residencies by Design: a study into co-designing future programs with museums ................................. 1149
COULSON Saskia and VALENTINE Louise

The connective role of improvisation in dealing with uncertainty during invention and design processes................................................................................................................................. 1171
SARANTOU Melanie and MIETTINEN Satu

Rethinking the prototyping process for applying design thinking to business model innovation1187
AMANO Tsuyoshi; BRASSETT Jamie and GREEN Lawrence and HESTAD Monika
Section 5.d

Introduction: Contemporary Brand Design: Designing meaningful brand experiences .......... 1209
RANCHHOD Ashok; NAGASAWA Shin’ya; GURAU Calin; SUGIMOTO Kana and ENSOR John

How is brand experience designed in practice? Results of a multiple-case study................. 1213
BAKKER-WU Sijia; CALABRETTA Giulia and HULTINK Erik Jan

Interacting with brands through advergames ........................................................................ 1227
GURAU Calin

Logos’ textual and visual content: the double anchorage effect ........................................... 1247
CELHAY Franck

Digital Interactions and Brand Experience Design: a future perspective ......................... 1263
WANICK Vanissa; RANCHHOD Ashok and Gurau Calin

Theme 6: Capabilities

Section 6.a

Introduction: Building New Capabilities in an Organization.................................................. 1287
DE LILLE Christine; PRICE Rebecca; WRIGLEY Cara and DORST Kees

The Application of UX Research in New Energy Vehicle Innovation .................................. 1291
XIAO Ning; TAO Menghan; ZHAO Xingfu; FAN Yi and LIU Wenbin

A Conceptual Framework of Dynamic Design Management Capability ................................ 1303
LIU Sylvia Xihui

Using Design Thinking to improve Strategic Decisions during Collaborative Sensemaking ....... 1319
KOTINA Ekaterina; KORIA Mikko and PRENDEVILLE Sharon

A model of service design elements to understand innovative service processes ............... 1343
LASSILA Sirpa; RIEPLE Alison and ENNIS Caroline

Externalising, sharing and comparing perceptions in engineering design ............................ 1361
HIRD Abi

Using actor-network theory to reveal strategy processes in design firms ............................ 1373
VAN DEN BROEK Antonius and RIEPLE Alison

Section 6.b

Introduction: Exploring Design Management Learning: Innovate with ‘user’ oriented design and KM perspectives ................................................................. 1391
BORJA DE MOZOTA Brigitte; NAM Ki-Young and WOLFF Fabiane

Industrial Evaluation of a Toolkit of Methods for Engineering Knowledge Management of Simulations........................................................................................................... 1393
SCHWEIGERT Sebastian; MARAHRENS Nils; CARRO SAAVEDRA Cristina and LINDEMANN Udo

Exploration in Knowledge Capital improvement through Social Media in Complex Product Design ................................................................. 1411
QI Wen

Application of a set of interdisciplinary quantitative methods on predicting a problem of vehicle design for elder drivers and assessing a design proposal ................................................. 1423
YANG Hao and WANG Yueran

Design Management Knowledge: Identifying Learning Objectives of Various Stakeholders for Needs-Driven Learning .......................................................................................... 1439
KIM Gye Young; NAM Ki-Young and BORJA DE MOZOTA Brigitte

Increasing Knowledge Seeking Initiation based on Theories of Human Behaviour ............... 1457
CARRO SAAVEDRA Cristina; OCON GALILEA Alicia and LINDEMANN Udo

An exploratory study of older customers’ holistic supermarket shopping experience in China .. 1475
YIN Yuanyuan; SONG Qiu and RANCHHOD Ashok
Section 6.c

Introduction: Design teams in the pursuit of innovation ............................................. 1489
GRAFF Daniel; CLARK Mark A; COMI Alice and FEI Fan

Exploring a colored linkography for identifying the members of design team .............. 1493
XU Jiang; CHUAI Ying and GAN Xiang

The design capabilities of dynamic teams pursuing innovation in an academic context ............................................. 1513
COULSON Saskia and WOODS Mel

– Volume 5 –

Section 6.d

Introduction: Designing the Designers: Future of Design Education ............................................. 1533
PETerson J Fiona; CHRISTIAANS Henri; GRIFFITH Selena and SADOwSKA Noemi

Inspiration Space: Towards a theory of creativity-supporting learning environments ........ 1539
THORING Katja; GONÇALVES Milene; MÜELLER Roland M.; BADKE-SCHAUB Petra and DESMET Pieter

The approach of didactic laboratory in fashion design education: a comparative case study ..... 1563
LIN Xiaozhu and DELL’ AQUA BELLAVITIS Arturo

Qualities of Entrepreneurial Design Conversations ............................................. 1577
VAN OORSCHOT Robin; SMULders Frido and HULTINK Erik Jan

Learning about others: Developing an interdisciplinary approach in design education ........ 1595
KAYGAN Pınar and DEMİR Özümcan

Gamifying design education .................................................................................. 1613
OBERPRIELER Kerstin; LEOnard Simon and FITZGERALD Robert

Educating Design Innovation Catalysts Through Design Interventions ............................................. 1633
HAMMEL Raphael and MOSELY Genevieve

Evolving pedagogy: is studio a state of mind? ............................................. 1653
McWHINNIE Louise and PETERSON J Fiona

Experience-led Design Strategy .................................................................................. 1667
FENN Terence and HOBBS Jason

Encounters and Shifting Identities: Students’ Experiences of Multi-Stakeholder Participatory Design ............................................. 1685
KAYGAN Harun; DEMİR Özümcan; KORKUT Fatma and GÜNGÖR BONCUKÇU İtir

Where have all the ideas gone? An anatomy of sketch inhibition among student designers ..... 1703
THURLOW Lisa and FORD Peter

Exploring Future of Graduate Design Education ............................................. 1719
SINGH Sapna

A Systems Approach to Taught Postgraduate Design Management ............................................. 1741
MAClARTY Elizabeth

Cultural Context and Service Design: developing critical and meaning-making capacity .......... 1759
SANTAMARIA Laura; ESCOBAR-TElLO Carolina; ROSS Tracy and BOHEMIA Erik

Author Index .................................................................................. 1795
Editorial: Research Perspectives on Creative Intersections

DE BONT Cees\textsuperscript{a}; HOLM Lisbeth Svengren\textsuperscript{b} and BOHEMIA Erik\textsuperscript{c}

\textsuperscript{a} Honk Kong Polytechnic University, Honk Kong
\textsuperscript{b} University of Gothenburg, Sweden
\textsuperscript{c} Loughborough University London; United Kingdom
doi: 10.21606/dma.2017.244

The conference general theme \textit{Research Perspectives on Creative Intersections} captured the overall conference spirit. It also reflects the conference planning and organisational processes which involved the community of international scholars located in different institutions, faculties, schools and departments.

The interdisciplinary nature of the conference enabled active intersections of scholars from the fields of design, social sciences and business studies. The mingling of researchers from diverse disciplines reflects the need for interdisciplinary approaches to research complex issues related to innovation.

The intersection between emerging and established researchers was an intended aspect of the conference. The reason was that today’s PhD candidates will drive the future research. The conference succeeded by attracting significant number of PhD candidates who represented a third of the conference delegates. This provides a good indication for the future growth research related to design innovation.

Altogether, 295 authors have submitted: 140 full papers and 31 workshop proposals. These numbers indicate that a single authored research is no longer the norm. The intersection which stems from collaboration amongst researchers to undertake and disseminate research is now becoming the established practice within the design innovation research.

The 19 conference tracks, for which the papers were submitted, were organised within 7 overarching themes (see Table 1). The track facilitators ultimately shaped the overall conference scope and direction. The tracks’ topics acted as the focal points for the overall Call for Papers. Thus, our thanks you go to all the 69 tracks’ facilitators. It was them who collectively were responsible for the conference programme and we would like to thank them for their valuable services on the International Scientific Programme Committee.
Table 1 Conference Tracks

<table>
<thead>
<tr>
<th>Theme 1) New Models of Innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Track 1a. The Interplay between Science, Technology and Design</td>
</tr>
<tr>
<td>Track 1b. Interdisciplinary Perspectives and Trends in Open Innovation</td>
</tr>
<tr>
<td>Track 1c. FROM R&amp;D TO D&amp;R: Challenging the Design Innovation Landscape</td>
</tr>
<tr>
<td>Track 1d. Design creating value at intersections</td>
</tr>
<tr>
<td>Track 1e. Design management transforming innovation strategy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Theme 2) Product-Service Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Track 2a. Capturing Value and Scalability in Product-Service System Design</td>
</tr>
<tr>
<td>Track 2b. Service Design for Business Innovation for Industry 4.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Theme 3) Policy Making</th>
</tr>
</thead>
<tbody>
<tr>
<td>Track 3a. Creative Intersection of Policies and Design Management</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Theme 4) Intersecting Perspective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Track 4b. Challenges and Obstacles to the Enactment of an Outside-In Perspective: The Case of Design</td>
</tr>
<tr>
<td>Track 4c. At the Intersection Social Innovation and Philosophy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Theme 5) Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Track 5a. Design practices of effective strategic design</td>
</tr>
<tr>
<td>Track 5b. Markets and Design: Vertical and Horizontal Product Differentiation</td>
</tr>
<tr>
<td>Track 5c. Foresight by Design: Dealing with uncertainty in Design Innovation</td>
</tr>
<tr>
<td>Track 5d. Contemporary Brand Design</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Theme 6) Capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Track 6a. Building New Capabilities in an Organization: A research methodology perspective</td>
</tr>
<tr>
<td>Track 6b. Exploring Design Management Learning: Innovate with 'user' oriented design and KM perspectives</td>
</tr>
<tr>
<td>Track 6c. Design teams in the pursuit of innovation</td>
</tr>
<tr>
<td>Track 6d. Designing the Designers: Future of Design Education</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Theme 7) Foundations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Track 7a. Pioneering Design Thinkers</td>
</tr>
</tbody>
</table>

We would like to also thank the over 150 expert reviewers who provided their valuable time to provide critical peer feedback. Their service on the International Board of Reviewers was invaluable as the good quality peer reviews provided a vital contribution to this international conference. Each reviewer scored papers on a scale of 0 to 10 and provided critical review comments. Most papers were reviewed by two people, though some had three or even four reviewers, and in a very small number of cases only one review was submitted. Total number of submitted full papers was 140. After the blind peer review process 66 papers (47%) were accepted and 49 (35%) papers were provisionally accepted as these needed major revisions, and 25 (19%) papers were rejected. In making the final decisions about papers, the Review Committee first looked at all papers where the difference of opinion between reviewers was 4 points or greater and moderated the scores if necessary. The Review Committee then discussed all papers that were just under the general level of acceptance to determine outcomes, before finally looking at any exceptions.
At the end of the review process 103 (73%) paper submissions were accepted for presentations of which 95 (68%) were included in the proceedings and 38 (27%) papers were rejected. Seven accepted papers were presented at the conference as research in progress and they were not included in the proceedings.

The workshops provided another intersection on how delegates and workshop facilitators interacted. Altogether, 31 workshop proposals were submitted and 17 (54%) workshops were accepted by the International Workshop Organising Committee. We would like to thank the International Workshop Organising Committee members: Katinka Bergema, Nuša Fain, Oriana Haselwanter, Sylvia Xihui Liu, Ida Telalbasic and Sharon Prendeville for providing their expertise.

We would like to thank both keynote speakers, Professor Jeanne Liedtka and Mr Richard Kelly, who generously gave their time to share their insights with the conference delegates. Their generosity allowed us to offer bursaries to five emerging researchers to attend the conference. The bursar recipients were selected from close to 40 applicants. The number of applicants indicates the need to setup funding schemes to allow emerging researchers to attend international events such as this conference.

The PhD Seminar event which took place a day prior to the conference was attended by over 100 delegates. The PhD Seminar was chaired by Dr Sylvia Xihui Liu and Professor Jun Cai. Initially 40 submissions were received of which 36 were presented at the event. The event culminated with a debate organised by the PhD students who were inspired by the “Open Letter to the Design Community: Stand Up for Democracy” by Manzini and Margolin (2017). We are grateful to the debate organisers.

The location of the conference in the Jockey Club Innovation Tower designed by Zaha Hadid at the Hong Kong Polytechnic University has also provided delegates with visible cultural intersections of a rapidly transitioning major interconnected global city from one political sphere of influence into another. The conference would not have happened without the solid work provided by the local organising team which was led by Professor Cees de Bont and consisted of: Ms Rennie Kan who took up the role of the fixer; Mr Pierre Tam who in his role as the Conference Secretary tirelessly worked on satisfying at many times conflicting requirement; Ms Flora Chang who checked and checked again all delegates registrations; Mr Rio Chan wizard of IT and Mr Jason Liu who provided the visual direction for the conference.

The Design Management Academy’s international research conference was organised under the auspices of the Design Society’s Design Management Special Interest Group (DeMSIG) and Design Research Society’s Design Innovation Management Special Interest Group (DIMSIG) in collaboration with: The Hong Kong Polytechnic University, Loughborough University, Tsinghua University, University of Strathclyde, Politecnico di Milano and Delft University of Technology. The conference was a culmination of two years of planning and the 2019 conference planning commenced well before the 2017 conference programme schedule was finalised. It is a hope that the conference will act as a platform to build a diverse community of scholars who are interested to explore and discuss design innovation practices.
Reference


About the Editors

**Cees de Bont** is dean of School of Design, Hong Kong Polytechnic University. His research interests are in the areas of early concept testing of consumer acceptance, branding, networked innovation and design education.

**Lisbeth Svengren Holm** is professor in Design Management at University of Gothenburg, Director of Business & Design Lab. Her research interests include design management, design & strategy, design & innovation, and the interaction between design and other functions.

**Erik Bohemia** is the Programme Director in the Institute for Design Innovation at Loughborough University London. He is interested in Design as a cultural practice and the material effects of design.
Section 6.d
This page is intentionally left blank.
Introduction: Designing the Designers: Future of Design Education

PETERSON J Fiona; CHRISTIAANS Henri; GRIFFITH Selena and SADOWSKA Noemi

School of Media & Communication, RMIT University, Australia
b Ulsan National Institute of Science & Technology, South-Korea
c University of New South Wales, Australia
d Regent’s University London, United Kingdom

In preparing programmes and curriculum to develop the designers of the future, educators are continually reminded of the ever-changing world of professional practice. Increasing levels of project complexity, technology uptake, cross-disciplinary and cross-cultural practice are providing many opportunities for design educators to develop innovations in the way we design and deliver education experiences.

In considering the future of Design Education and how students might be prepared for professional practice, the papers in this track explore a range of ideas, from encouraging student engagement, and identifying new professional roles, to proposing frameworks for educators, and provocations for re-thinking learning and teaching designs. Innovation is a common theme in a context of rapid change.

We begin with Where have all the ideas gone? An anatomy of sketch inhibition among student designers. In this paper, Lisa Thurlow and Peter Ford reflect upon the importance of traditional skills development alongside digital processes. They advocate a greater awareness of digital and manual tools and design-specific research types.

Interdisciplinary practice is another focus. In Learning about others: Developing an interdisciplinary approach in design education, Pınar Kaygan and Özümcan Demir highlight the importance of interdisciplinary practice for complex problem solving in a context of developing technology and innovation. In their case study, they recount students’ learning experiences, including the development and understanding of collaboration approaches across disciplines.

Xiaozhu Lin and Arturo Dell’Acqua Bellavitis take this further in comparing pedagogy and communication across cultures. The approach of didactic laboratory in fashion design education: A comparative case study discusses Chinese students experiencing a different
pedagogical approach in a didactic laboratory, versus the transmission style they were familiar with before. This resulted in the development of different competencies suited to the rapidly evolving global industry context.

In their paper, *Cultural context and service design: Developing critical and meaning-making capacity*, Laura Santamaria and colleagues report on the experimental introduction of a socio-cultural lens to the design process. They underline the interconnections between design and innovation.

With a focus on design as a social activity, Robin van Oorschot, Frido Smulders and Erik Jan Hultink also discuss *Qualities of entrepreneurial design conversations*. They suggest that local creation of meaning helps students in the business proposition development process.

Harun Kaygan and colleagues focus on partnerships within participatory design projects, in their paper *Encounters and shifting identities: Students’ experiences of multi-stakeholder participatory design*. They emphasise that regular encounters with multiple stakeholders are necessary in fostering openness and flexibility in students’ self-image as designers, as well as versatility in approaches appropriate to the context.

Building on this, Terence Fenn and Jason Hobbs discuss ways to assist students in developing strategic resolution of complex design problems. Their paper, *Experience-led design strategy*, describes examples of applying two design tools and related techniques to guide students’ strategic design thinking.

In *Gamifying design education*, Kerstin Oberprieler, Simon Leonard and Robert Fitzgerald again highlight the importance of designers being able to deal with complexity and develop innovative solutions. They suggest that educational practice falls short, however, in terms of multi-disciplinary and multi-modal contemporary learning styles. In linking the challenges faced by gamification and experience designers, they also suggest that gamification can engage students and improve learning outcomes.

In *Exploring future of design education*, Sapna Singh highlights the dynamic nature of design and future roles for designers, including: traditional designer; constructive design researcher; hybrid co-designer; and systems sense maker. Scenarios and implications for curriculum design and development are described.

Raphael Hammel and Genevieve Mosely also discuss a new professional role in their case study in *Educating design innovation catalysts through design interventions*. They see the use of design to innovate as an emerging practice in organisations, facilitated by a role they describe as a ‘design innovation catalyst’. They argue that this thinking can inform curriculum development and improving the effectiveness of future educational programmes, as students prepare for employment.

In her paper, *A systems approach to taught postgraduate design management*, Elizabeth MacLarty describes the responsibility of design academics in linking theory with practice in organizational contexts. She proposes a professional practice schema as a bridge between theory and practice of teaching and managing coursework (taught) postgraduate design management programmes.

Ways in which the physical environment influences creativity of designers and design students is the focus of Katjaa Thoring and colleagues, in *Inspiration space: Towards a*
theory of creativity-supporting learning environments. Their insights, drawn from literature and eight interviews, are intended to inform designing or adjusting creative learning spaces, whilst also working towards a theory of creativity-supporting learning environments.

In *Evolving pedagogy: Is studio a state of mind?* Louise McWhinnie and J Fiona Peterson position design studios as potentially becoming mainstream for innovative creative practice, within and across disciplines. In exploring the influence of place and space on learning and working in studio, they see the studio emerging as a new form of educational state of mind. They suggest that adapting conceptions of studio can be effective in supporting students, in design and other disciplines, as they prepare for evolving industry practice.

**Papers**

The following papers are included in the conference proceedings for this Designing the Designers: Future of Design Education track:

**Where have all the ideas gone? An anatomy of sketch inhibition among student designers** — THURLOW Lisa and FORD Peter, De Montfort University, Leicester, UK.

**Learning about others: Developing an interdisciplinary approach in design education** — KAYGAN Pınar and DEMİR Özümcan, Department of Industrial Design, Middle East Technical University, Turkey.

**The approach of didactic laboratory in fashion design education: A comparative case study** — LIN Xiaozhu and DELL’ACQUA BELLA VITIS Arturo, Department of Design, Politecnico di Milano, Italy.

**Cultural context and service design: Developing critical and meaning-making capacity** — SANTAMARIA Laura, ESCOBAR-TELLO Carolina, ROSS Tracy, BOHEMIA Erik, Design School, Loughborough University, UK.

**Qualities of entrepreneurial design conversations** — VAN OORSCHOT Robin, SMULDERS Frido and HULTINK Erik Jan, Delft University of Technology, The Netherlands.

**Encounters and shifting identities: Students’ experiences of multi-stakeholder participatory design** — KAYGAN Harun, DEMİR Özümcan, KORKUT Fatma and GÜNGÖR BONCUKÇU Itir, Department of Industrial Design, Middle East Technical University, Turkey.

**Experience-led design strategy** — FENN Terence and HOBBS Jason, University of Johannesburg, South Africa.

**Gamifying design education** — OBERPRIELER Kerstin\(^a\)\(^b\), LEONARD Simon\(^b\) and FITZGERALD Robert\(^b\)

\(^a\)ThinkPlace, Australia. \(^b\)INSPIRE Centre for Innovation in Education and Training, University of Canberra, Australia.

**Exploring future of design education** — SINGH Sapna, The Ohio State University, USA.

**Educating design innovation catalysts through design interventions** — HAMMEL Raphael and MOSELY Genevieve, University of Technology Sydney, Australia.
A systems approach to taught postgraduate design management – MACLARTY Elizabeth, Northumbria University, UK.

Inspiration space: Towards a theory of creativity-supporting learning environments – THORING Katjaa b, GONÇALVES Milenea, MUELLER Roland Mc, BADKE-SCHAUB Petraa and DESMET Pietera

a Delft University of Technology, NL. b Anhalt University of Applied Sciences, D. c Berlin School of Economics and Law, D.

Evolving pedagogy: Is studio a state of mind? – McWHINNIE Louisea and PETERSON J Fiona b

a Faculty of Transdisciplinary Innovation, University of Technology Sydney, Australia. b School of Media & Communication, RMIT University, Australia.

Conclusion

Among all papers trying to answer the question of how to prepare and empower design students to solve complex societal problems, there is a common understanding that creativity and innovation are key tools in the designers’ tool-kit. Thus, design education should foster these aspects as part of the current and future role of the designer. But how? The papers show a myriad of approaches, thereby contributing to the process of informing what design is and the value it carries in a broader context.

Here the track contributions highlight the importance of a mindset and an interdisciplinary problem solving approach, with a focus on people as the main value framed by the broader socio-cultural context. The influence of the physical (and virtual) space such as the design studio, gamification, direct relation with industry and the confrontation with multiple stakeholders, entrepreneurship, a systems approach with a holistic view on the increasing complexity of societal problems, scenario building, participatory and co-creation methods, and experience-led design, capture the breadth of current debates on design education.

Through exploring tools and teaching methods, teaching environments and teaching for professional practice, the papers contribute four broad recommendations on the future of design education: (1) the value of ongoing reframing of traditional design education through new lenses; (2) the significance of practice-based learning to foster empathy amongst students for the professional design practice and its wider influence; (3) introduction of new opportunities which come with new technologies, new thinking, and new global and local lifestyle needs; and (4) identification of opportunities to reframe boundaries of design education and practice through interdisciplinarity and collaborations.

The wide range of contributions captured by the track offers a diverse view of what design education is and its potential for the future, including new perspectives and avenues to discover. Thus, this collection is an invitation for all to take part in the conversations in how we can ‘design the designers’ and explore the future of design education and in turn the future of design practice and theory.
About the Track Facilitators

**Associate Professor Fiona Peterson**, MEd, PhD is a Principal Fellow of the Higher Education Academy, UK. She is the Chief Investigator of an Australian cross-disciplinary learning and teaching research project on digital employability futures; and author of a book, *Creative Leadership Signposts in Higher Education*.

**Chair professor Henri Christiaans** is dean of the School of Design & Human Engineering at UNIST, South-Korea. He was involved in the development and implementation of new design programs at universities all over the world. His research interests are in design methodology and education.

**Selena Griffith** is UNSW Engineering Scientia Experience Manager and Senior Lecturer in the UNSW Business School’s Centre for Social Impact. She is interested in how design methods can be used for social impact and how they can be used to facilitate cross disciplinary collaboration. Selena is chief editor of the book *Visual Tools for Developing Cross-disciplinary Collaboration, Innovation and Entrepreneurship Capacity*.

**Dr Noemi Sadowska** is a Senior Fellow of the Higher Education Academy, UK and Head of Programme with experience in curriculum development and programme launch. Her research examines learning experiences emerging when management and design intersect resulting in conceptual shifts defining learners understanding of both disciplines.
This page is intentionally left blank.
Inspiration Space: Towards a theory of creativity-supporting learning environments

THORING Katjaab*; GONÇALVES Milenea; MUELLER Roland M.; BADKE-SCHAUB Petraa and DESMET Pietera

a Delft University of Technology, Netherlands
b Anhalt University of Applied Sciences, Germany
c Berlin School of Economics and Law, Germany
* Corresponding author: katja@thoring.com

Building on the assumption that the physical environment can have an influence on the creativity of designers and design students in particular, the aim of this paper is to provide theoretical propositions and evidences for this relationship. We develop various propositions about the influence of physical environments on creativity, based on eight expert interviews and supported by literature. A particular focus was given to the environments of design educational institutions. We present a summary of the main insights and visualize the developed propositions as a causal graph addressing how space influences creativity. These propositions can be regarded as a first step towards a theory of creativity-supporting learning environments and they can serve as a reference when designing or adjusting creative learning spaces.

keywords: workspaces for design; creativity; design education; creative learning space

Introduction

Background
Educating future designers is more than just designing curricula, lecturing students, and assigning project work: one of the probably least considered aspects in design education is the physical environment, although it can be argued that it potentially has an impact on students’ creativity, wellbeing, and learning performance. The questions whether a space...
can facilitate the learning process, enhance the wellbeing of students and teachers, and most notably foster creativity and innovation have remained under-researched. Simultaneously, an increased interest in creative learning environments is emerging in the area of elementary schools and kindergartens (e.g. Boys, 2010; Dudek, 2000; Ehmann, Borges, & Klanten, 2012; Kaup, Kim, & Dudek, 2013). However, not many studies have been conducted on the realm of adult design educational environments (design schools and universities). Therefore, this paper aims to derive a theoretical foundation on ‘creative learning spaces’, based on a systematic empirical and theoretical investigation of the topic.

**Related Literature**

There is a long history of research that investigates the effects of space on work productivity (e.g. Oseland, 1999). In the last decades, creativity and innovation became a bigger part of work, and therefore the interest in the connection between space and creativity grew (Dul & Ceylan, 2014; Dul, Ceylan, & Jaspers, 2011; Kristensen, 2004; Lloyd, 2001; Moultrie et al., 2007). There are only few papers that looked at creative learning spaces in design educational contexts (e.g. Cannon & Utriainen, 2013; Jankowska & Atlay, 2008; Jones & Lloyd, 2013; Leurs, Schelling, & Mulder, 2013; Setola & Leurs, 2014; Weinberg, Nicolai, Hüsam, Panayotova, & Klooker, 2014). However, to the best of our knowledge, there is no paper that tried to create a systematic and evidence-based theory for creative learning spaces, which is the objective of this paper.

**Creativity**

There exist numerous definitions of creativity. Most authors distinguish between creativity as an outcome (a creative solution) and creativity as a process. Creativity as an outcome should be novel (in terms of being original, unique, and surprising), meaningful, and useful at the same time (e.g. T.M. Amabile, 1996, 1996; Boden, 1996; Sarkar & Chakrabarti, 2007; Sawyer, 2006; Stein, 1953; Sternberg, 1988; Weisberg, 2006). Gero (1996) added ‘unexpectedness’ to this definition, and Simonton (2012) added ‘surprise’. Creativity as a process, on the other hand, was first described by Wallas (1926), as a four-step creative problem solving process consisting of:

- Preparation (investigation of the problem in all directions)
- Incubation (unconscious processing)
- Insight / Illumination (sudden creation of a solution)
- Verification (critical elaboration and validation of the idea)

Building on this, Guilford (1950) introduced the concept of divergent and convergent thinking, as a mode of thinking to explain creativity. Diverging means producing a large quantity and variety of ideas, whereas convergent thinking describes the process of narrowing down to one solution—a concept that nowadays is also very popular in design thinking (Brown, 2009). Later, Guilford differentiated between flexibility (the variety of ideas; diverging into different directions) and fluency (the quantity of ideas produced) as important elements of a creative process (Joy Paul Guilford, 1967).

Since our interest focuses on the ability of the built environment to facilitate a creative working and learning process, the definitions of creativity as a process are more relevant for our study. Hence, our research question is centred around the questions if, and if yes...
how, the learning environment of a design school can facilitate (a) flexibility of ideation and (b) fluency of ideation, as well as (c) how it can provide appropriate spaces for preparation, incubation, illumination, and verification. Additionally, other creativity concepts, such as fixation (the inappropriate repetition of existing solutions, (e.g. Cardoso & Badke-Schaub, 2011; Jansson & Smith, 1991; Purcell & Gero, 1996)), priming (the activation of a specific—for example creative—mindset (e.g. Sassenberg, Moskowitz, Fetterman, & Kessler, 2017)), and serendipity (the unexpected finding of valuable ideas, persons, and things, (e.g. Goldschmidt, 2015; Meusburger, Funke, & Wunder, 2009)) will guide our analysis process.

Previous work
To structure our study, we refer to a ‘Typology of Creative Learning Space’ (adapted from Thoring, Luippold, & Mueller, 2012a) that outlines five different types of creative learning spaces, as well as five different qualities, which can be a characteristic of such a creative learning space. The space types are: personal space, collaboration space, presentation space, making space, and transition space. The qualities are: space as a knowledge processor, space as an indicator of (organizational) culture, space as a social dimension, space as stimulation, and space as infrastructure. Figure 1 illustrates the different types and qualities of creative learning spaces.
Methodology

Theory Development
The objective of this paper is to present the groundwork of a novel theory about the influence of the built environment on creativity. According to Popper (1934) a theory is an abstracted model of the reality. Building on that, Gregor (2006) differentiates between five types of theories: Type 1 Theories for Analyzing that only describe and analyze the reality, for example as a typology (what is?). Type 2 Theories for Explanation that attempt to provide explanations for specific incidents (what is, how, why, when, and where?). Type 3 Theories for Prediction that provide predictions but without causal explanations (what is and what will be?). Type 4 Theories for Explanation and Prediction that provide predictions and also testable propositions and causal explanations (what is, how, why, when, where, and what will be?). And Type 5 Theories for Design and Action that suggest explicit prescriptions for constructing an artifact (how to do something?). The presented
paper constitutes a Type 4 Theory as it aims to provide explanations for and predictions of the possible impact of spatial specifications on creative performance. The presented hypotheses are testable, however, an actual test is not part of this paper. We provide evidences for each presented hypothesis that are based on expert interviews and supported by related literature. Similar to evidence-based management (Pfeffer & Sutton, 2006), we aim for evidence-based creative spaces, beyond hype and fashion. Our presented hypotheses are probabilistic, not deterministic, which means we search for factors that make the outcome in general more likely (Jaccard & Jacoby, 2009). We do not claim that these hypotheses are valid for everybody in all circumstances. Instead, we are interested in the rich insights of possible contingencies. Therefore our main sources for the hypotheses are—next to the literature—qualitative interviews and cases. We propose a qualitative probabilistic causal theory (Pearl, 2000) of creative space. In the future we want to build upon this and develop the theory further into a Type 5 Design Theory (Shirley Gregor & Jones, 2007) with design principles (how to design creativity-supporting environments).

**Expert Interviews**

We conducted 8 semi-structured interviews with experts from the fields of Design Education, Innovation, Product Design, Workplace Furniture, Architecture, and Interior Design. Those experts were chosen to cover a wide variety of different perspectives on the topic of creative learning environments within the three clusters of interest: Design, Education, and Space.

For the design group (DES) we included interviews of two design practitioners (one working in a leading position at the major design agency IDEO, the other one running her own studio). For the group of educators (EDU), we included three experts from various design disciplines and different design universities (a professor for urban design, a professor for strategic design, and a professor for design thinking and innovation). And finally, for the group of architecture, interior architecture, and furniture (ARCH) we included three interviews: one architect, specialized in design educational buildings, one interior architect, specialized in innovation spaces, and one furniture manufacturer, specialized in educational furniture. The chosen experts also represent a cultural diversity in terms of their country of origin and their place of work, in order not to limit the insights to one particular national culture. The covered nationalities include German, US-American, Venezuelan, and Swedish, while their places of work include also Denmark, Switzerland, and Austria. Table 1 shows an overview of the included interviews.

**Table 1  Overview of Expert Interviews**
<table>
<thead>
<tr>
<th>No.#</th>
<th>ID</th>
<th>Years of Experience</th>
<th>Main Expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DES-1</td>
<td>15+</td>
<td>Design Manager at IDEO in US and Germany</td>
</tr>
<tr>
<td>2</td>
<td>DES-2</td>
<td>10+</td>
<td>Spatial designer and artist</td>
</tr>
<tr>
<td>3</td>
<td>EDU-1</td>
<td>20+</td>
<td>Professor for Urban and Social Design</td>
</tr>
<tr>
<td>4</td>
<td>EDU-2</td>
<td>30+</td>
<td>Writer and Professor for Innovation</td>
</tr>
<tr>
<td>5</td>
<td>EDU-3</td>
<td>20+</td>
<td>Professor for Strategic Design</td>
</tr>
<tr>
<td>6</td>
<td>ARCH-1</td>
<td>5+</td>
<td>Lead of interior design of D-School</td>
</tr>
<tr>
<td>7</td>
<td>ARCH-2</td>
<td>10+</td>
<td>Lead of architectural Design Umeå Design School</td>
</tr>
<tr>
<td>8</td>
<td>ARCH-3</td>
<td>15+</td>
<td>European Manager at Steelcase for Educational Furniture</td>
</tr>
</tbody>
</table>

The semi-structured interviews were guided by a set of open questions (the full interview guideline is available upon request). The interviews were structured into two main parts: First we asked about experiences or thoughts related to the five space types and five spatial functions (as outlined in Figure 1—the typology of creative learning spaces). The second set of questions related to general characteristics of a space (materials, colours, furniture, etc.) and what impact these might have on creativity, wellbeing, and learning. The interviewees also ranked these characteristics to indicate their priorities. Finally, the interviewees were asked about their personal experiences and preferences within their own working environment. All questions were open and allowed for the sharing of personal insights and stories, also beyond the prepared questions. The interviews were audio-recorded and later transcribed (non-verbatim). The final eight interviews had a total of 9.7 hours of audio data—an average of 72 minutes per interview. The interviews were transcribed and imported into Atlas.ti for further analysis.

- The following code structure was developed in order to analyse the data. The code structure consists of 5 groups with 178 codes in total:
  - group 1 = Impact
    contains 3 codes (Creativity, Learning, Wellbeing). For this paper only “creativity” is analysed.
  - group 2 = Evaluation
    contains 4 codes (positive evaluation, negative evaluation, high priority, low priority)
  - group 3 = Space Types (according to the Typology outlined in Figure 1)
    contains 33 codes; 5 codes for the space types (individual work space, collaboration space, making space, presentation space, and transition space), and 28 subcodes with exemplary spaces for each space type, according to the typology presented in the introduction (e.g. CollaborationSpace>Classroom, CollaborationSpace>Studio, etc.)
  - group 4 = Space Qualities (according to the Typology outlined in Figure 1)
    contains 26 codes; 5 codes for the spatial qualities, according to the typology presented in the introduction (Culture, Infrastructure, Knowledge Processor, Social Dimension, Stimulation), and 21 subcodes with exemplary qualities for each category (e.g. Stimulation>Inspiration, Stimulation>Distraction, etc.)
The interview data was coded by two researchers. Any arising question during the coding process was discussed immediately until an agreement was found. The first step of the analysis process was to filter all data against the code ‘creativity’, because the main objective of this study is to investigate the possible impact of the space on creativity. The data was coded with this term in cases where the experts mentioned the term ‘creativity’ either autonomously, or after prompts from the interviewer, and where quotes appeared that were talking about closely associated aspects such as ‘innovation’ or ‘idea generation’. Thus 86 text segments were coded with ‘creativity’ and served as the basis for the development of the propositions. Further analysis and interpretation led to propositions about the possible impact of space on creativity. In a second step, these identified segments were checked against other codes that appeared in close proximity, as these aspects might also have an influence on creativity as well. The resulting 161 adjacent codes were ranked according to the frequency of their appearance in the interview texts. The most frequent occurrences were the subcodes ‘Stimulation-Inspiration’ (10), ‘Atmosphere-Welcoming’ (9), and ‘Atmosphere-Homely’ (6). As these aspects might also have an impact on creativity, the entire data was cross-checked for these codes for new insights. Through this procedure, additional quotes were identified that appeared to be of high relevance for the spatial impact on creativity and were included in the analysis and the final development of 12 propositions. In the following section the developed propositions are described in more detail.

**Propositions about the Impact of Space on Creativity**

We present a set of 12 propositions that suggest an influence of spatial characteristics on creativity. Each proposition is based on quotes from the interviews. Supporting or contradicting literature is presented for each proposition, where applicable. Table 2 presents an overview of the identified propositions along with a link to related creativity definitions as described in the introduction of this paper, while Table 3 summarizes the related evidences (supporting or contradicting quotes from the interviewees as well as from the literature). Figure 2 illustrates the propositions (possible cause-and-effect relationships of spatial elements towards creativity) as a graph.

**Table 2 Twelve Propositions**

<table>
<thead>
<tr>
<th>P#</th>
<th>Proposition</th>
<th>Explanation</th>
<th>Creativity Theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td><strong>Surprising Space</strong></td>
<td>strange, unexpected, imperfect space triggers curiosity and hence creativity, forces people to interpret and generate their own ideas</td>
<td>Illumination, Flexibility, Serendipity</td>
</tr>
<tr>
<td>P#</td>
<td>Proposition</td>
<td>Explanation</td>
<td>Creativity Theory</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>P2</td>
<td><strong>Space as a Platform for Ideas</strong></td>
<td>space to manifest ideas; large space lets the mind expand and allows building and testing more and larger sized models</td>
<td>Fluency, Verification</td>
</tr>
<tr>
<td>P3</td>
<td><strong>Creative Chaos</strong></td>
<td>triggers creativity as it prompts associations; if space is filled with old projects might lead to fixation</td>
<td>Flexibility, Serendipity, Fixation</td>
</tr>
<tr>
<td>P4</td>
<td><strong>Visual Stimuli</strong></td>
<td>visible materials, books, and other information can inspire new ideas and increase creativity</td>
<td>Preparation, Flexibility, Fluidity, Fixation</td>
</tr>
<tr>
<td>P5</td>
<td><strong>Reduced Stimulation</strong></td>
<td>white space, empty space fosters creativity, invites people to project their own ideas into it</td>
<td>Incubation, Illumination, Avoid fixation</td>
</tr>
<tr>
<td>P6</td>
<td><strong>Tactile, Olfactory, and Acoustic Stimuli</strong></td>
<td>materials, smells, cooking, and sound inspire creativity</td>
<td>Incubation</td>
</tr>
<tr>
<td>P7</td>
<td><strong>Making Spaces</strong></td>
<td>Space that allows to make things manually fosters creativity</td>
<td>Verification</td>
</tr>
<tr>
<td>P8</td>
<td><strong>Open View</strong></td>
<td>Window view, inspires creativity, lets the mind expand</td>
<td>Incubation</td>
</tr>
<tr>
<td>P9</td>
<td><strong>Bodily Activity Movement</strong></td>
<td>visible movement or own movement (e.g. walking, sports) facilitates creativity</td>
<td>Incubation</td>
</tr>
<tr>
<td>P10</td>
<td><strong>Playful Experimental Atmosphere</strong></td>
<td>Games, toys invite to experiment, risk-taking, and allow failure; Ownership of space</td>
<td>Incubation, Flexibility, Verification</td>
</tr>
<tr>
<td>P11</td>
<td><strong>Creative Labelling</strong></td>
<td>designating a space for creative work, or historic creative surroundings can set a mood or mindset receptive for creativity</td>
<td>Preparation, Priming</td>
</tr>
<tr>
<td>P12</td>
<td><strong>Social Interaction</strong></td>
<td>creative people are more important than space, so space should facilitate meeting and exchange</td>
<td>Flexibility, Incubation, Serendipity</td>
</tr>
</tbody>
</table>

In the following, each proposition is described in more detail and linked to related literature, where applicable. Furthermore, selected interview quotes are presented that support the respective proposition.
Figure 2  Causal Graph illustrating the relationships and influences according to the propositions towards creativity (+ indicates increasing effect, – indicates decreasing effect)
Proposition 1 (P1): Surprising Space
Strange, unexpected, or imperfect spaces, which have unusual shapes that result in ‘dead’ or unused corners, or reveal surprising interiors can have a positive impact on creativity. Students could use these spaces to implement their own designs or install small exhibitions. Such surprising, unexpected, or even defective spaces trigger curiosity, provide surprising stimuli and hence force people to interpret and generate their own ideas. This can result in an increased variety of ideas by establishing connections between disparate concepts (flexibility), or it can provide coincidences (serendipity), or result in a sudden idea (illumination).

*Within this School of Architecture there were some spaces that are very tall, they’re over 10 meters and only maybe one meter in wideness and they’re not accessible of course. These started to be used by the students; they hang things there and for example they study how sound is being transported within such a room and they try to visualize that with the installations. Very inspiring how they attack the space.* (ARCH-2)

*When I was working in this Frank Gehry Building you would think round fosters creativity and so on, but it was quite the opposite. There was no way of placing the tables inside that room. And when your space is constantly invaded because it’s round and you have people walking behind you and so on. It just doesn’t help you connect with the space.* (EDU-3)

According to Flipowicz (2006) surprise can cause a cognitive shift, which fosters creativity. Also, Grace and Maher (2015) suggest that surprising stimuli could enhance creativity. On the other hand, spaces that are too impractical, might result in quite the opposite. A good balance of surprising and functional spaces seems to be the sweet spot.

Proposition 2 (P2): Platform for Ideas
When working creatively you need some space to manifest your ideas. This can range from a post-it note, to a whiteboard, a writeable wall, or a huge studio to build things. The larger this platform, the more possibilities one has to manifest ideas, which can result in the generation of many solutions (fluency). The manifestations also allow to visualize, discuss, and validate ideas, together with others or as a testable prototype (validation). Also, a large space lets the mind expand and allows creating more or literally larger ideas (e.g. build larger sized models).

*The size of the space is extremely important. I had a smaller Studio before and all my designs were smaller as well. A large space allows you to think bigger, create bigger ideas, and build bigger models [translated by author].* (DES-2)

*Ideas manifest creativity and that manifestation must be part of the process and you manifest in different ways: shop, studio, even if you are acting things out, you need a sort of stage.* (EDU-2)

Boundary objects (Star & Griesemer, 1989), such as sketches, canvases, or prototypes, are plastic enough for information to be adapted and interpreted differently by different communities, but robust enough to maintain informational integrity. They support
distributed cognition by eliciting and capturing tacit knowledge through interactions with the boundary objects (Henderson, 1991). Boundary objects support social and individual creativity in several ways: by moving from vague ideas to more concrete representations; by producing records of mental thought outside of the individual memory; by providing means for others to interact, critic, and build upon the ideas; and by establishing a common language of understanding (Fischer, Giaccardi, Eden, Sugimoto, & Ye, 2005). Space can establish a platform for these boundary objects and act as a boundary object itself—a sort of boundary space.

**Proposition 3 (P3): Creative Chaos**

Although the question whether creativity is fostered by a work space that is clean or messy largely depends on personal taste or culture, there are some interesting principles that can be derived about the concept of creative chaos.

*I could not start a new project when the material from the previous one is still on my desk. Similarly, no one would stick the new post-it note on top of the old one. If you want to create something new you need to start fresh, to create new associations. Otherwise there’s the risk to reproduce the same stuff again and again. During the project, however, it may be chaotic and messy. [translated by author] (ARCH-1)*

*For me, messy is really inspiring. Yeah. I make connections when things are really messy. (EDU-3)*

Some of the interviewees were indifferent about creative chaos or mentioned positive as well as negative aspects of chaotic environments at the same time. A little bit of chaos is inspiring, but too much hinders the creative workflow. Moreover, the degree of acceptable chaos also depends on the project status. While chaos would be considered tolerable during a project (caused by the project’s own materials), chaos produced by old materials from previous projects would be hindering at the beginning of a new project. This could be related to the concept of fixation, which suggests that visible material from earlier projects bears the risk of hindering one’s creativity, by becoming stuck to those old ideas. On the other hand, in a chaotic environment new connections can be made based on coincidental material combinations or mistakes (serendipity), which can result in more variety of ideas (flexibility). Also, Clark (2007) describes chaos and order as two interconnected elements of the creative process that need to be in balance. Depending on the state of the project either one has advantages and disadvantages. Zausner (1996) suggests that a creative process shows non-linear dynamics and is hence always somewhat chaotic. Chaotic processes have both randomness and unpredictability, which can be explained by the creativity concepts of flexibility and serendipity.

As a conclusion, space should facilitate a good balance of chaos and order, for example by providing appropriate storage facilities.

**Proposition 4 (P4): Visual Stimuli**

Designers and design students often refer to visual stimulation for inspiration, which became also evident in most of the interviews.
And if I start putting things or paintings in the walls and stuff then I get a little bit distracted. [...] There are moments when distraction really pays off and I think visual distraction creates ideas. (EDU-3)

...whereas inspiration comes from books and magazines [...] [translated by author] (EDU-1)

Gonçalves et al. (2014) investigated the inspirational approaches of designers and identified that there is a high preference for visual material, mainly from the Internet, but also from magazines and books. Goldschmidt and Smolkov (2006) present findings that the presence of visual stimuli is positively correlated with the emergence of creativity. Goldschmidt (2003) suggests that the exhibition of sketches, either self-generated or created by colleagues, elicits "backtalk" (i.e., reinterpretation and reflection of visual material created). Backtalk of sketches can then elicit multiple reinterpretations and potentially lead to creativity. Goldschmidt (2007) investigates team-shared mental models that are supported by sketches. Visual representations of work produced (sketches included but also posters and other visual outcomes of design projects) enable communication of ideas and convergence of mental models within team members. In the same way, visual stimuli in the form of past projects produced by students can establish connections across other students. Following this concept, visual stimuli can increase flexibility and validation. Van der Lugt (2005) claims that sketching can be used as a design team's ‘external memory’: Generated visual representations, such as sketches, can support reinterpretation of ideas, either individually and in group, and helps keeping track of the solution space already explored. However, visual stimuli might also trigger fixation effects as students can become too attached to visible material instead of developing their own designs (Cardoso & Badke-Schaub, 2011).

**Proposition 5 (P5): Reduced Stimulation**

Reduced Stimulation, such as white walls or empty spaces, help the mind to relax and lose focus—often described as daydreaming. The brain switches frequently between two modes: the focused-mode and the defused-mode of thinking (Immordino-Yang, Christodoulou, & Singh, 2012; Moussa, Steen, Laurienti, & Hayasaka, 2012; Oakley, 2014; Raichle & Snyder, 2007). The focused mode (also called highly attentive state) is “a direct approach to solving problems using rational, sequential, analytical approaches” (Oakley, 2014, p. 12) mostly related to the prefrontal cortex. In the defused mode (also called resting state network or default-mode network) the mind wanders and connects different areas of the brain in a more relaxed manner (Oakley, 2014). The focused mode and defused mode are similar to the concepts of vertical and lateral thinking of de Bono (2009). The defused mode is associated with higher creativity (especially with divergent thinking) (Takeuchi et al., 2012).

Although visual stimulation can act as a source of inspiration, the exact opposite can also have a positive influence on creativity. White walls or other white spaces facilitate daydreaming and invite people to project their own ideas into it.
I had this picture frame from my grandmother. I left it white and I really like looking at it; I don’t look at the frame, I look at the white space in the middle and I project the ideas into it. (EDU-3)

I prefer to have a white space, a white canvas, where I can spread out my thoughts, [...] if you would fill everything with inspirational material, that would have to be removed later to leave empty space for the next one [translated by author] (EDU-1)

However, McCoy and Evans (2002) demonstrated that spatial complexity influences creative performance positively. In this context, spatial complexity refers to complex environments, both in terms of how the space is organized and in terms of decoration. Decorative elements include personalization of the space and other objects, such as lamps or artwork. Their own results corroborate with Amabile's (1990) findings, which indicate that complex and provocative spaces trigger creativity. As this is partly in contradiction to the insights formulated by the experts, this proposition needs further investigation.

Proposition 6 (P6): Tactile, Olfactory, and Acoustic Stimuli
Besides visual stimuli, also other senses can be stimulated, which can have an influence on creativity, such as sound, smells, or tactility.

McCoy and Evans (2002) mention that complexity and variation—within the realm of materials—lead to high creative potential. They showed the importance of materials use in creativity. Natural materials, such as wood, were considered important to creativity. Kudrowitz et al. (2014) draw parallels between creative processes and cooking. Mehta et al. (2012, p. 785) suggest that “a moderate (vs. low) level of ambient noise is likely to induce processing disfluency or processing difficulty, which activates abstract cognition and consequently enhances creative performance”. Hence, it can be argued that such stimuli are positive for creativity as long as they occur in a moderate degree.

I think materials are hugely important, I’m a very tactile person. And I think in terms of representing and promoting creativity, I think material surroundings are very important. It’s visually stimulating. (EDU-2)

Cooking is hugely creative, if I had to redesign the curriculum I would make cooking part of all creative curriculums, [...] cooking would be key because there is so much to it: in terms of choices, colours, taste, textures, process, cooperation, the whole thing a creative process that is really similar to everything else. Creating a dish is like creating a company. (EDU-2)

Proposition 7 (P7): Making Spaces
Making Spaces, such as workshops, are a central spatial element of every design school. However, the importance of manual prototyping for creativity could be even further facilitated by establishing tinker desks in each classroom or by providing prototyping materials at hand.

Somehow, you think differently when you touch things or when you try to build. You really come up with ideas that you cannot have come up by
sketching or by looking out the window. You think different when you’re making. (EDU-3)

Yes, changing position of work is part of this definitely. [...] I do believe that our brain works very well when we switch in between different thoughts like using your hands or your body doing something physically and using just your mind, so to speak, writing something or drawing then of course you use your hands still, but it's in less extent than building something or doing something physically. This interplay in between activities is quite important. (ARCH-2)

Youmans (2011) investigated the influence of prototyping and material use in relation to fixation. Although he did not necessarily relate it to creativity, one can argue that if fixation is reduced when working with physical materials, then prototyping can potentially support creativity. Fonseca et al. (2009) established a connection between prototyping and creativity, within the domain of Human Computer Interaction in a Computer Engineering course.

Proposition 8 (P8): Open View
An open view outside a window into nature or an urban environment can have a positive effect on creativity and inspiration. The expansion of the mind into the outside world could facilitate the incubation effect. Moreover, views across rooms can also provide visual stimuli and foster social interaction.

if I’m trying to write here and I’m trying to look for a creative idea, I always look outside the window. (EDU-3)

McCoy and Evans (2002) suggest that looking into a nature environment would foster creativity. On the other hand, Farley and Veitch (2001) could not confirm this hypothesis in their studies. Students in windowless rooms showed the same creative performance as in rooms with a view. However, participants of their study confirmed a higher level of wellbeing when performing in rooms that provided a window view.

Proposition 9 (P9): Movement and Bodily Activity
Movement, either actively (e.g. when walking or exercising) or passively (e.g. when sitting in a train or looking outside a window onto a busy street) can trigger a creative mood up to the sudden appearance of an idea (illumination). This can be explained by the relaxation state of the mind in which the mind wanders and connects different areas of the brain in more relaxed manners (Oakley, 2014), (refer also to Proposition 5—Reduced Stimulation). This sort of daydreaming could be facilitated through the space, for example by providing transitions spaces that require walking between buildings to get from A to B, or by providing some movement outside the windows. That way the space can facilitate the incubation phase.

I feel very much creative when I’m moving in the space, for example my best ideas I have when I’m walking or when I’m inside a car. Somehow movement for me triggers me a lot. (EDU-3)
I cannot be creative without exercising two times a week [translated by author] (DES-1)

Personally I think you learn, the more you move the more you learn. There is a connection between your physical activity and your mind work, so to speak. There was always this old idea of when you walk you think very well and you discuss very well when you walk. I don’t know if it's fixed to everyone but I can sense that importance of physical activity while thinking or doing some intellectual work. (ARCH-2)

Oppezzo and Schwartz (2014) experimentally demonstrate that walking boosts creative ideation. Kim (2015) conducted experiments in which participants had to squeeze a stress ball, which was either soft and malleable or hard. When participants got the soft one, the physical activity led to divergent ideas (in terms of originality and flexibility), while squeezing a hard ball led to convergent solutions (only one correct answer). Also, Gondola (1986), Steinberg et al. (1997), and Colzato et al. (2013) provide evidences that physical exercise has a positive effect on creative performance. Space could facilitate this by providing infrastructure for exercising, moveable (swivel) chairs, or furniture that allows or enforces different work positions. Also the view to a moving or busy exterior can facilitate a similar purpose.

Proposition 10 (P10): Playful and Experimental Atmosphere
Creating a playful atmosphere can have several positive effects on creativity: it stimulates experimentation and risk-taking, which facilitates flexibility of ideation. At the same time fun and games support the incubation phase. And finally, trial-and-error and failure are encouraged, which facilitate validation of ideas.

I hope that it expresses this freedom of unfolding yourself like feeling like here I’m allowed to do my studies the way I believe is interesting and not saying, “Oh you should design this way.” or it should have this generosity towards each individual that they feel that they can develop in their own direction. (ARCH-2)

A design school needs to have a protected space, a safe space in which you can act as you want, say what you want, design what you want, and where you do not feel embarrassed. Criticism from others helps connecting the dots and establish associations [translated by author]. (ARCH-1)

For example, Berretta and Privette (1990) studied the influence of play on creative performance and were able to confirm an outcome of significantly greater creative thinking skills in children that practiced flexible play. Also Lieberman (2014, p. 30) suggests that the concept of play can instigate creativity by increasing spontaneity and flexibility, and support divergent thinking.

Proposition 11 (P11): Creative Labelling
Sometimes, just calling a space a ‘creative space’ or an ‘innovation lab’ can put someone into a mood receptive for creativity. Also the historic atmosphere of creative surroundings
seems to have a similar effect. People tend to mimic the historic role models from art and design that might still be virtually present in their surroundings.

Well, the fact that Parsons is down in the Village which has traditionally been the center of creativity in this city is really important. I mean Jackson Pollock lived a block from here. The whole movement, abstract movement, they all lived here. (EDU-2)

And of course there is the “Innovation Lab”, and it [just the name] worked—it spread really fast like everybody was talking about it. Suddenly, everybody wanted to use it [...]. But now, all of a sudden, everything is about innovation. Yeah. (EDU-3)

The labelling of a space as specifically designated for creative activities can either result in people preparing and being motivated for this task (preparation) or even adapting the respective creative mindset (priming). This also includes not only the verbal naming of a space but also the design style of the space’s interior. Bhagwatwar et al. (2013) studied brainstorming performances in virtual environments. Their results indicated that people perform more creatively in spaces that are labelled to prime team members for improved creativity.

Proposition 12 (P12): Social Interaction
Several experts stressed the importance of social interaction with creative people to share ideas and feedback. In a way they suggested that the people are more important than the space. However, a good creative space can also facilitate and enforce those interactions.

I mean, I worked in circular offices, I worked in square offices, I worked in dark offices, light offices, sometimes we’d be sitting in the end of the room or sitting at the center of the room and I wonder that what triggers my creativity especially on spaces is I have to say it’s not the space but it’s the people inside. I see the people as a trigger of thinking. (EDU-3)

All innovations basically emerge in the smoking corners, these informal spaces where everybody passes by and conversations come up [translated by author] (EDU-1)

McCoy and Evans (2002) have identified that spaces that promote social interaction have a positive impact on creativity. This proposition is also supported by Amabile (1983), Zuo et al. (2010), Shaw (2010), and Le Dantec (2010). Space can facilitate social interaction through several means, such as strategic positioning of meeting points (e.g. copy machines), lounge furniture, or transparent walls, to name just a few examples.

Summary
Figure 2 illustrates the main propositions as a set of causal graphs including the involved variables. The expected impact is illustrated by an arrow, labelled with a plus sign (+) if the impact is positive (increasing), or labelled with a minus sign (−) if the impact is negative (decreasing). The 12 propositions and related evidences are also summarized in Table 3.

Table 3 Summary of Evidences for the 13 Propositions
<table>
<thead>
<tr>
<th>P#</th>
<th>Proposition</th>
<th>Supporting Interview</th>
<th>Supporting Literature</th>
<th>Contradicting Interview</th>
<th>Contradicting Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td><em>Surprising Space</em></td>
<td>ARCH-2, EDU-3</td>
<td>Filipowicz, Grace and Maher (2015)</td>
<td></td>
<td>EDU-3</td>
</tr>
<tr>
<td>P2</td>
<td><em>Space as a Platform for Ideas</em></td>
<td>DES-2, EDU-2, EDU-3, ARCH-1, ARCH-2, ARCH-3</td>
<td>Fischer et al. (2005)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P6</td>
<td><em>Tactile, Olfactory, and Acoustic Stimuli</em></td>
<td>EDU-2, ARCH-2</td>
<td>McCoy and Evans (2002), Mehta et al. (2012)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P7</td>
<td><em>Making Spaces</em></td>
<td>EDU-1, EDU-3, ARCH-2</td>
<td>Fonseca et al. (2009), Youmans (2011)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P10</td>
<td><em>Playful, Experimental Atmosphere</em></td>
<td>EDU-3, ARCH-1, ARCH-2, ARCH-3</td>
<td>Lieberman (2014), Berretta and Privette (1990)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P#</td>
<td>Proposition</td>
<td>Supporting Interview</td>
<td>Supporting Literature</td>
<td>Contradicting Interview</td>
<td>Contradicting Literature</td>
</tr>
<tr>
<td>----</td>
<td>---------------------------</td>
<td>----------------------</td>
<td>-----------------------</td>
<td>-------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>P11</td>
<td><em>Creative Labelling</em></td>
<td>EDU-2, EDU-3, DES-2, ARCH-1, ARCH-3</td>
<td>Bhagwatwar et al. (2013)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Conclusions**

This paper presents a collection of propositions that form a preliminary theory of the spatial impact on creativity in design educational contexts. The propositions are developed based on eight expert interviews and supported by relevant literature. The work presented in this paper is considered a starting point for further research. Further literature searches and studies are needed for those aspects where no supporting or contradicting literature was found (indicated as empty cells in the respective tables). Of particular interest are also those aspects that have both, supporting as well as contradicting evidences. Here, further research is needed to clarify these questions. Although there is a large body of complementing results there are also several conflicting aspects, what in fact means: When changing one spatial aspect to gain positive influence on creativity this might have a negative impact on another aspect. Solving such conflicts will be the focus of our future work as well.

The scope of this study is on experts of design educational spaces, only. We did not include the perspective of students in this paper. However, in previous work we conducted an extensive study with students of two educational institutions that lead to the development of the typology presented in Figure 1 (Thoring, Luippold, & Mueller, 2012b; Thoring et al., 2012a).

As a conclusion, we argue that the results presented in this paper are of high relevance for design education, as they will contribute to a better understanding of the influence of spatial design aspects on creativity of design students. Although the main aim of this paper is to provide insights that can support improving the learning environments of design students, the presented propositions might also be useful to practitioners in any area that deals with creativity and innovation, as well as to educators from other disciplines, who want to create inspiring environments for students and teachers.

**References**


(last retrieved 15.1.17)
McCoy, J. M., & Evans, G. W. (2002). The potential role of the physical environment in fostering
spaces: towards a framework for understanding the role of the physical environment in
innovation. Creativity and Innovation Management, 16(1), 53–65.
in Resting-State fMRI Connectome Data. PLOS ONE, 7(8), e44428.
Oakley, B. A. (2014). A mind for numbers: How to excel at math and science (even if you flunked
Oppezzo, M., & Schwartz, D. L. (2014). Give your ideas some legs: The positive effect of walking on
creative thinking. Journal of Experimental Psychology: Learning, Memory, and Cognition, 40(4),
1142.
London: Chartered Institution of Building Services Engineers.
University Press.
Guidelines for a Decision Support Method Adapted to NPD Processes. Paris, France: Design
Society.
to increase creative performance by facilitating the activation and use of remote associations.
University Press.
Negotiating a Shared Vision on Creative Learning Spaces. In DS 78: Proceedings of the 16th
International conference on Engineering and Product Design Education (E&PDE14), Design
Education and Human Technology Relations, University of Twente, The Netherlands, 04-05.09.
2014.
of Science, 19, 387–420.


About the Authors

**Katja Thoring** is professor at Anhalt University of Applied Sciences in Dessau and Visiting Researcher at Delft University of Technology. Her background is in Industrial Design and research interests are creative space, innovative research methods, and design education.

**Milene Gonçalves** is an assistant professor at TU Delft. A designer by training with a PhD on Design creativity from TU Delft, she identifies herself as a Design Researcher, with an emphasis on creativity, inspiration and cognition.

**Roland M. Mueller** is professor at the Berlin School of Economics and Law, Germany. He is an expert in Business Intelligence, Big Data, theory modelling, and lean design thinking.
Petra Badke-Schaub is professor for design theory and methodology at TU Delft. She is head of Design & Methodology section at Faculty of Industrial Design Engineering and one of the initiators of SIG Human Behavior in Design in Design Society.

Pieter Desmet is professor of Design for Experience at the Faculty of Industrial Design of TU Delft. He is board member of the International Design for Emotion Society and founder of the Delft Institute of Positive Design.
This page is intentionally left blank.
The approach of didactic laboratory in fashion design education: a comparative case study

LIN Xiaozhu* and DELL’ ACQUA BELLAVITIS Arturo

Politecnico di Milano, Italy
* Corresponding author: xiaozhu.lin@polimi.it

With the rapid rise of globalization over the past several decades, fashion as a structurally diverse global industry is being forced to re-assess its role in response to these changes. The pace of change in the global fashion industry also requires us to re-evaluate our international fashion design education. During the 20th DMI conference held in the US in 2016, scholars have discussed the challenges that international fashion design students, especially Chinese international students encountered when experiencing unfamiliar teaching approach of the didactic laboratory. This paper illustrates a case study conceived as a parallel investigation, showing how Chinese fashion design students respond to different teaching approach of their own, and how the approach of didactic laboratory could help to improve and cultivate fashion design students competencies. We hope that this case study could provide a basis for reflection and critical discussions for the future works.

* keywords: fashion design education; didactic laboratory; cross-cultural education

Introduction

Fashion as a broad and complex social phenomenon is recognized to be a significant part of culture and society. It is not by chance that scholars like Simmel, Veblen or Barthes had described fashion as a paradigm to understand the whole society. For centuries, fashion has been one of the most prominent and poignant indicators of the cross-cultural interchange. With the rapid rise of globalization over the past several decades, the spread of fashion across global cultures has mirrored the changes in economy, culture, and daily life that globalization has brought (Nagle, 2015). In such global context, fashion as a
structurally diverse industry is being forced to re-assess its role in different countries in different ways in response to these changes (Bugg, 2010). The pace of change in the industry, in the meantime, also requires us to re-evaluate our international fashion design education.

It was noted that although fashion studies have gained momentum over the last decade as an interdisciplinary field of research, fashion as an academic subject has remained weak and reductive. There is a growing awareness, both locally and internationally, that fashion education needs to extend the entrenched model with its strong emphasis on practical concerns and studio activity to include research activities that will raise the profile of fashion design within the academic arena (Smal & Lavelle, 2011).

During the seminar “The Year Ahead” organized by an Italian fashion magazine AMICA INTERNATIONAL in Milan in 2016, Ann-Sofie Johansson, the creative advisor of H&M head office, shared her opinion about the most important competencies that young fashion students and designers should acquire to meet the demands of the constantly changing global fashion industry. “Besides the creativity,” she said, “I believe that teamwork and collaborations today are crucial for everyone, it is not just about ‘me’ any longer, even though maybe it is still like that in some design schools. I think the future will be even more about collaborations, you need to share knowledge and ideas with others, […] and fashion designers should also have excellent communication skills since there will be many people who are going to buy into your idea or not. So being able to be vocal and present your idea in a best possible way is essential.”

These desired competencies, meanwhile, has uncovered the challenges for fashion schools as well as for students themselves. With the increasing number of students studying fashion design abroad, fashion institutions have experienced unprecedented challenges than before. As many studies have indicated, despite the opportunities and benefits that study abroad programs created, international students encounter a broad range of difficulties when they live and study abroad. International students come from different countries with different backgrounds and experiences; they have various types of skills and knowledge in fashion design education. Hence, they are concerned about getting used to new ways of learning. Compared to domestic students, international students encounter more difficulties adapting to the new learning situation. They face various challenges regarding cultural and communication problems, which are, related to language difficulties, academic unfamiliarity, as well as socio-cultural issues (G. Lin & Yi, 1997; Yeh & Inose, 2002; Hus, 2003; Sovic, 2009; Sherry, 2010).

During the 20th DMI conference held in the US in 2016, scholars have discussed the challenges that international fashion design students, especially Chinese international students encountered when experiencing unfamiliar teaching approach. In this paper, we will first illustrate some prior knowledge and observations, and then subsequently, report on pedagogical development work in fashion design education. Through a case study conceived as a parallel investigation, showing how Chinese fashion design students respond to different teaching approach of their own when encountering no language difficulties and socio-cultural problems, and how such teaching approach could help to improve and cultivate Chinese fashion design students’ competencies.
Teaching fashion design through didactic laboratory

The educational innovation of the so-called “didactic laboratory” emerged at the end of the seventies in Germany. Those who supported this innovation considered learning not as the product of teaching process, but a process in which direct experience activates learner. The idea of an educational practice based on a laboratory approach “does not necessarily coincide with the common conception of a laboratory but it takes the form of a research and learning environment whose focal point is making the most of the methodological aspects” (Fasano & Casella, 2001).

The approach of didactic laboratory takes the shape of work organized into projects, from the formulation of the project idea (on what we intend to work) to the definition of the objectives to achieve. This approach lays stress on an intersubjective exchange between students and teachers through the same mode of work and collaboration, conjugating both the teachers’ professional and teaching skills, which allows not only transmitting knowledge but, very often, opening new paths towards knowledge. In a didactic laboratory, students would be able to organize and reorganize their knowledge in a continuous “doing and being able to do” way. It is also supported by the emotional involvement, by the enjoyment and the curiosity of the individual and of the group about the process of discovery, which brings to the achievement of a shared objective. The didactic laboratory is an optimal solution for combining knowledge and know-how, to concretize the educational dimension of teaching and learning: students can develop the projects individually and collectively according to their competencies and attitudes.

Characteristics of didactic laboratory

During a lecture at Università Ca’ Foscari Venezia, Prof. F. Tessaro has indicated some essential features of the didactic laboratory:

- It is a place in which a reversal of teaching perspective is carried out: the goal is not about how much teachers should know about the theories of particular disciplines, but in which mode can these disciplines construct the students’ competencies.
- It is, above all, a place to construct knowledge: so that the content and the proposed procedures are not just directly overlapped on already possessed knowledge, but to interact with them, allowing a reconstruction through new ways of connection and organization. It is necessary to find out effective linkages between the teaching content and the diversified experiences of students.
- It is a cognitive adventure: during the teaching-learning process, both teachers and students become travelers, the traveling and the challenging are the learning process (the Bateson’s exploration metaphor). The didactic laboratory is the most suitable place to undertake such cognitive adventure.
- It is a place to realize the metacognition: the didactic laboratory focuses not only on the core or acquired skills but also, more importantly, on the understanding and utilization of these skills. In fact, the metacognitive approach is a method of multi-purpose and transversal intervention during the learning process.
- It is a place to work cooperatively: in a didactic laboratory, one can concretize new teaching/learning models, based on the interaction between students and teachers during the educational processes.
In the didactic laboratory, the relation between individual experience and social reconstruction is emphasized, so that the theories are needed to answer the question “Why,” this makes the study process meaningful and motivating. The teaching process in the didactic laboratory should always address, through properly designed activities, both acquiring and consolidating of the skills. Based on these activities, we then add the activities of development (deepening, widening and enriching).

**Previous work and feedback**

In 2014, Politecnico di Milano - School of Design launched an international program with Beijing Institute of Fashion Technology. The program was determined to introduce a stage dedicated to promoting and supporting the cross-cultural fashion design education.

*Politecnico di Milano (POLIMI)* is the largest technical university in Italy. The school is ranked 7th for art & design in the world, according to the QS World University Ranking 2017. Different from other fashion institutions, fashion design degree at POLIMI does not aim to train a fashion “stylist” but a fashion “designer,” who is not an artist, isolated in his/her talent but a designer who is inspired and linked to the fashion system and its constraints.

*Beijing Institute of Fashion Technology (BIFT)* is China’s premier educational facility associated with fashion, mainly specializing in art and technology. Its School of Fashion Art and Engineering is well connected with the domestic textile industry and offers a broad range of individual programs responding to the industry’s need for specialized professions in textiles.

Until 2016, we have received four groups of students from BIFT, 37 of them in total. Each group of students comes and stays here in Milan for one academic year. They are all third-year undergraduate students from BIFT, join POLIMI Design School students, following postgraduate program - Fashion System Design. In this one year, we arranged ten different courses for the students, all of these courses are in English (see Table. 1). Each semester they have one main “didactic laboratory” together with other theoretical and practical lessons.

*Table 1 One-year course arrangement of BIFT@POLIMI program*

<table>
<thead>
<tr>
<th>First semester</th>
<th>Second semester</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fashion Design Studio (Didactic Laboratory)</strong></td>
<td><strong>Retail and Merchandising Design (Didactic Laboratory)</strong></td>
</tr>
<tr>
<td>Fashion Aesthetics (Field visitings and discussions)</td>
<td>History of Design (Theoretical and field visitings)</td>
</tr>
<tr>
<td>Communication for Fashion (Theoretical)</td>
<td>Trend Forecasting for Fashion (Theoretical and Practical)</td>
</tr>
<tr>
<td>Fashion in the Arts (Art Seminars)</td>
<td>Story Telling in Design (Practical)</td>
</tr>
</tbody>
</table>
In POLIMI fashion design education, the “Didactic Laboratory” weighs 40% of the overall program (including the final thesis and internship). In the paper “cross-cultural perspective and polytechnical approach for fashion education: a case study of an Italo-Chinese international program” (Lin & Dell’ Acqua, 2016), we have illustrated detailly one didactic laboratory - the “fashion design studio,” introduced about its structure and purpose. The aim of the fashion design studio is to give students through short workshops the largest knowledge of the fashion industry. In these didactic laboratories, our Chinese students got a chance to work together with professors and students from different design disciplines and cultural backgrounds, in which inevitably they observed differentiating approaches of their home academic and pedagogical tradition.

![Figure 1](image)

Students work in groups during the fashion design studio in POLIMI

At the end of this one-year study experience, we asked each of the students to complete a questionnaire composed of close-ended and open-ended questions, to gain insights into their learning experiences and the challenges they faced. The open-ended questions are focusing on student’s opinions on different approaches in fashion design education and suggestions for future students and faculty members participating in such study abroad programs.

Student’s feedback is a precious and valuable source of information for both formative and summative purposes. Receiving feedback could be seen as a continuous process of conversation and reflection, it is an essential component of assessment for learning, which if used appropriately can support and scaffold student’s learning (Hattie & Timperley, 2007). Gathering student’s feedback can help instructors know what they are doing that facilitate the learning of the students and it will contribute to making teachers aware of any difficulties they may be having with their instruction. It allows teachers to make adjustments and changes in class, which will be beneficial both to students and educators.

**Feedback from BIFT students**

The review of feedback from BIFT exchange student’s learning experiences in POLIMI suggested that although students overall were quite satisfied with their learning experiences regarding educational quality, teaching styles, and support, they still faced many challenges and went through an arduous process of adjustment. One of the open-
ended questions is “what are the major differences between POLIMI fashion design curriculum and that of your previous school’s?” Here we illustrate some of the students’ answers:

“Compared to our teaching methods, the POLIMI learning process requires us to be more self-motivated and to communicate initiative with students and teachers from other countries. The learning atmosphere here in POLIMI is much more lively and stress-free, and teachers also encourage you to explore and to think by yourself. None of the teachers will deny your idea directly since the notion is based on your understanding, they do not judge what is right or wrong, but to give you suggestions and guidance, and eventually, they encourage you to think independently. So you do not feel afraid to say things wrong, just to be brave enough to say it. In the beginning, this was tough for me, but when you realized that no matter what idea you want to express, you will be encouraged to say it freely, slowly you begin to build confidence in your ideas and on yourself.”

“I think the most differently to our’s is, in POLIMI, our works are revolving around some already existed brands or events, but in our school, most of the time our works are based on some invented or premature brands. Therefore, the research study part has always been skipped in our teaching process.”

“Our Italian classmates do spend much time researching all the relative information of that brand before doing the design part, and this is worth to be learned by us. Compare to them, our Chinese students usually skip the research and jump directly to the design part, which seems efficient and quick, but in fact, it is not correct.”

“In POLIMI the knowledge we learned is relatively more systematic and comprehensive, we were able to get to know each single point of the whole fashion system, the structure of the curriculum in POLIMI is more intense and explicit.”

“In my previous school we do not do much teamwork, most of the time we work alone and separately, but here in POLIMI, we are encouraged to work in groups. The suggestions that I would like to give to our fellow students are: don’t be afraid to communicate with other international students, and learn to work and collaborate with your team members, these abilities are fundamental and necessary.”

**Observation from POLIMI Instructors**

International programs like this also allow instructors to observe, compare and contrast their teaching attitudes, methods of education and the performance of their students with those from other countries. As Spizzica (1997) stated that different cultures value different types of knowledge and skills differently, the ways to acquire this knowledge and skills might also differ from one culture to another. Here we illustrate some differences and challenges we observed during teaching and coaching our Chinese students:

- **Teaching & learning styles mismatch**
  
  We noticed that Chinese students preferred the didactic and teacher-centred style of education, they expected to follow teachers’, or teammates’ lead or step-by-step guidance during the design process. They expected the teacher to help them connect each point of knowledge and deliver a sequenced and organized indication for them to follow. While Italian teachers prefer being facilitators in classrooms, encouraging discussions, providing only general
direction and push students to think and defend what they know, they prefer student start with exploration and research followed then by the development of skills and design.

- Teamwork
Two main themes emerged regarding teamwork. The first concerned the Chinese students’ unfamiliarity with teamwork. Many of them reported that as undergraduate students their study processes are often a solitary activity that does not provide much opportunity for developing team working skills. We observed that our Chinese students found it is not easy, particularly in the beginning, to work with other international students. They prefer doing group work and discussion in a less formal learning environment, but they become silent when it comes to formal revision with teachers.

The second theme concerned the composition of the group. To avoid the all-Chinese and predominantly Chinese groups, teachers need to encourage and sometimes force them to mix with other international students. We noticed that in the group with only Chinese students they use only Chinese to communicate in the classroom, which has no help for them to experience cultural exchange with other international students.

- Academic oral presentation
The oral presentation - especially open discussion part - was a great challenge to most of our Chinese students. During the oral presentation, many students just read the prepared text of a set of slides without interacting with the audience, and some of them are not able to time their presentations correctly. As some students reported, the language incompetency and lack of confidence, as well as concerns about criticism by others, may lead to the unsatisfactory performance in the oral presentation. We observed that the poor presentation performance is related also to their unfamiliarity with participatory communication modes in the Italian classroom, and their limited opportunity in practicing.

A comparative case study
Based on the feedback and observation from our previous work, a five-day workshop was conducted at BIFT during the first week of September 2016. This workshop is conceived as a parallel investigation, aims to understand more about Chinese fashion design students’ preparation and attitudes for engaging with a differentiated approach to fashion education - the approach of the didactic laboratory, while encountering no language difficulties and socio-cultural issues.

We, therefore, want to understand Chinese students’ learning needs and whether or not Chinese students feel especially challenged by adopting of this pedagogical approach. An understanding of these problems may help instructors address these issues without replacing completely well-established, successful, student-centered methods of teaching design courses, a situation reported by Bartlett and Fischer (2011).

Workshop of decoding fashion brand’s DNA
General info
This five days workshop took place at the beginning of the course “Textile Brand Planning,” which is the last course of students’ four-year undergraduate study in BIFT. The aim of this workshop is to help students better understand, before starting building a brand, what brand’s DNA is, and what is the difference between brand identity and image. Brand DNA is a primary source for fashion companies to build and develop a brand through the identification, establishment, and communication of what is at its core, knowing one’s true identity makes it easier to speak the right message to intended audiences and allows for an active, consistent, relevant, and differentiated brand.

By adopting the approach of the didactic laboratory, the workshop will investigate and evaluate students’ attitudes and competencies of teamwork and academic oral presentation. Through the workshop, students are expected to develop awareness and ability of their preferred team working styles and learn to communicate and present their works efficiently and persuasively.

Participants

The participants of the workshop are all undergraduates from BIFT - School of Fashion Art and Engineering, 20 third-year students and 28 fourth-year students. We divided 48 students into 14 groups: each group composed by 1/2 third-year student and 1/2 fourth-year student.

Program

Table 2  Timetable and structure of the workshop

<table>
<thead>
<tr>
<th>Time</th>
<th>Thursday 01/09</th>
<th>Friday 02/09</th>
<th>Saturday 03/09</th>
<th>Sunday 04/09</th>
<th>Monday 05/09</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:30</td>
<td>Opening Lecture/ 1° part briefing</td>
<td>Students’ First Presentation</td>
<td>Students’ Semi-Presentation</td>
<td>Teamwork/ Revision</td>
<td>Students’ Final-Presentation</td>
</tr>
<tr>
<td>11:30</td>
<td>13:30</td>
<td>Teamwork/ Revision</td>
<td>Teamwork/ Revision</td>
<td>2° part briefing/ Teamwork/ Revision</td>
<td>Teamwork/ Revision</td>
</tr>
<tr>
<td>16:30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The workshop began with an opening lecture of general knowledge essential in decoding the fashion brand’s DNA, the key components of successful brand DNA. Then followed by a case study as an example that glance into the identities of a 150-year history Italian luxury brand - Fendi, showing students how understanding a brand’s identity can help
charter the brand’s territory, guide new product launches, and help manage the creative process underlying advertising and product design.

Figure 2  Opening lecture about decoding the fashion brand’s DNA

The working part then, will, in turn, be devoted to students’ teamwork and presentation, decoding the chosen brands’ DNA, making comparisons between them and presenting their works in front of the class. During students’ teamwork, in the meantime, the teacher will do revision with each single group, coaching them one-to-one allows a flexible approach to help and guide each student.

During the first half of the workshop (from 01/09 afternoon to 03/09 morning), students are asked to analyze 7 Italian fashion brands (chosen by the teacher): GUCCI, VALENTINO, PRADA, ARMANI, DOLCE & GABBANA, MOSCHINO, FERRAGAMO.

During the second half of the workshop (from 03/09 afternoon to 05/09 morning), students are asked to analyze some Chinese fashion brands (chosen by students), and at the end, make a brief comparison between the Italian and Chinese brands they have studied and analyzed.

The Chinese brands chosen by students are AIMU, LANYU, LIUQING YANG, SHUSHU TONG, UMA WANG, JNBY, MUSEUM OF FRANDSHIP, SHIATZY CHEN, WU YONG, NE TIGER, SANKUAN ZHE.

The workshop is ended up with a closing lecture, introducing them the form and spirit of Italian fashion design, the POLIMI fashion design education and the approach of the didactic laboratory. During the lecture, we showed some of POLIMI fashion design student’s works and also invited our former bift@polimi international program students to come and share their experiences.

Feedback from BIFT students
At the end of this workshop we asked each of the students to write a brief report about their experiences and suggestions, here we illustrate some of their feedbacks:

“It is my first time to participate a workshop; we used to individual tasks, we have almost no group work activity. However, during these five days, we got a chance to work and
collaborate with unfamiliar people. [...] We learned not only the professional knowledge, about how to analyze a brand’s DNA, but also how to think systematically and to present something complex in a brief but clear way.”

“In this workshop, I experienced a different class teaching mode. It is not like our traditional teacher-centered way: teacher points out knowledge for students to learn and repeat. In this workshop, it is more student-centred: teachers guides and lets students explore by themselves. This mode requests more self-learning ability, which is what we lack and what should be developed more.”

“Maybe because of lacking self-confidence, afraid to make mistakes in front of people or to be laughed by others, I always feel uncomfortable to do the presentation. Moreover, I do not get the meaning of doing the presentation, isn’t it just about putting a bunch of images and read the prepared texts in front of the class and no one listens to or care about what you said. However, after this workshop, I realized that in the slides the images and keywords should be chosen very carefully, the layout of slides could be organized so well, that was something I did not expect before. [...] About teamwork, it is different from working by yourself, you need to take into account the ideas and opinions of your team members, and everyone thinks so differently, which led to many contradictions, and at this time learn to communicate appropriately become crucial.”

“This workshop alert us about our insufficiency of communication and expression skills, which are the abilities that Chinese students need to improve the most. Our Chinese students just ‘do’ but don’t ‘talk,’ very often they are not able to present their design confidently to enterprises, or even though they are confident enough to express themselves, they just talk with no organization, not able to seize the central idea. After this workshop, I think everyone got a breakthrough, especially on choosing the proper content, the keywords, and images, on timing and summarizing the presentation, and it also encouraged us to speak on the stage.”

“This workshop made me understand the importance of doing research before designing. The research part is fundamental to the “design,” it ensures the final design from deviating the original concept and purpose. [...] The teamwork and presentation is a precious experience for us because in our four-year study we do not have many chances to work in teams, not even mention to team up cross gradely. We found that effective group collaboration is very much stronger than working individually on complex problem-solving.”

“I think one of our Chinese students’ weaknesses is afraid to express their ideas in the class. During the workshop, after each presentation, the teacher gives comments, points out our problems accurately and helps us to improve them, I think this step is vital and useful; this will contribute to preparing us for our future career. Moreover, I do hope our school can organize more workshops like this in the future.”

**Suggestions and Conclusion**

It is very satisfying to see that after this workshop, besides the professional knowledge that our students acquired, their teamwork and oral presentation skills also got much improved. Those who used to work individually, have learned and found their preferred team working styles; and those who felt afraid or didn’t know how to present in front of
the class, have encouraged themselves and overcome this challenge. We suggest that more opportunities should be offered to students to practice, at the same time, after students have demonstrated their works, feedback should be given in time and adequately, the longer the time gap between the completion of the work and its feedback, the less efficient the feedback becomes. It is important for students to know how well they are doing as they learn.

Regarding students’ benefits and skills gained, activities like this also allow instructors to exchange their insights and opinions. The instructor from BIFT who has supported and followed this workshop suggests that, when first introducing this didactic laboratory into Chinese classroom, students may not be able to make a quick adaptation to this new teaching approach. So every single step, the “why,” “what” and “how,” should be introduced and explained very clearly to students in advance, to avoid the confusion, misunderstanding and time wasting. It is also necessary to state the theme and summarize the content and the knowledge for students during the lesson, to assure the quality of teaching and learning.

During the revisions and student’s presentations, our POLIMI instructor observed that, except for the unfamiliarity of teamwork and deficiency of oral presentation practice, in general, Chinese students’ abilities to summarize, analyze, critical thinking and problem solving are still relatively weak, and mostly, students lack metacognitive skill. They often feel puzzled in adopting the appropriate methods and strategies during the design process, and relied a lot on their teacher, waiting for instructions, words of approval, correction or praise. The insufficiency of metacognitive skill may persist due to the Chinese traditional top-down cramming teaching mode, which also led to in adaptation of other different teaching approaches. In traditional teaching atmosphere, the interaction between teachers and students is very neglected, teachers explain, analyze, and summarize too much, students receive knowledge passively, and they do not have much time and space to think by themselves. We suggest that the training of the fashion design student’s metacognition skills should be embedded into Chinese classroom activities, which is also one of the principle objectives addressed in the didactic laboratory. It is important not only for students’ current academic study but also creates the foundation for their future learning, which helps them to develop more flexible design approach and to prepare them better for solving future unfamiliar and challenging tasks.

Learning is and should be, an initiative and positive process, as constructivist learning theory states, the students’ initiative participation is essential. Moreover, the social constructivism, one branch of the constructivism, contends that categories of knowledge and of "reality" itself are actively created by and are the products of social and symbolic relationships and interactions. Hence, by cooperating and communicating with others, students can build up their knowledge system, cultivate their creative and problem-solving ability. The approach of the didactic laboratory, on this basis, corresponds to the constructivist-social paradigm. As Belibani and Panunzi (2011) mentioned, in a laboratory-based didactic model, “teamwork becomes central, and interaction is emphasized with the aim of creating a product by forming a learning community that can operate beyond the timescale of the course”(p.51).

When discussing with our Chinese instructors, we understand that the trajectory of curriculum development in today’s Chinese fashion education institutions is shifting from
drawing and artistic aspects of fashion to a “creative thinking” and a focus on “selling” the design and products. The connection between companies and school are closer than before. The abilities like flexibility, team working, critical thinking, problem-solving, and independent learning are considered increasingly important for today’s Chinese students. To cultivate such skills, which are “not traditionally considered important” (Wang, 2007), more and more instructors are absorbing and drawing on the experiences of the Western teaching approaches. However, how to incorporate these approaches reasonably, considering both Chinese fashion design students’ background and fashion design institution’s philosophy, and at the same time to balance the “creativity” with “marketability” correctly, are still issues need to be addressed and resolved. We hope that this case study could provide a basis for reflection and critical discussions for the future works.

Acknowledgments
Authors of the study thank colleagues from Politecnico di Milano, School of Design for supervising and supporting this international program, and Beijing Institute of Fashion Technology, School of Fashion Art and Engineering for collaborating and offering valuable suggestions. Thank also to all our students for their valuable works.

References
Fasano, M. & Casella, F. (2001), The didactic laboratory as a place to experiment models for the interdisciplinary research, in M. Michelin (Ed.), Proceedings of the international conference developing formal thinking in physics, Udine, Italy.


About the Authors

**LIN Xiaozhu** Ph.D. candidate from Politecnico di Milano, Department of design. Research interests lie in the areas of internationalizing of the curriculum, fashion design discipline, cross-cultural education. She obtained her MSc from Politecnico di Milano, BSc from University of Florence.

**DELL’ ACQUA BELLAVITIS Arturo** Director of the Milan Triennale Foundation and Exposition. Full professor of industrial design, interior design, textile design and fashion design at Politecnico di Milano. Former president of School of Design, Politecnico di Milano.
Qualities of Entrepreneurial Design Conversations

VAN OORSCHOT Robin*; SMULDERS Frido and HULTINK Erik Jan

Delft University of Technology, Netherlands
* Corresponding author: r.vanoorschot@tudelft.nl
doi: 10.21606/dma.2017.43

In our daily practice of teaching and coaching students how to develop their business proposition for their high tech new ventures, we build on innovation and design sciences. In developing their business proposition, students engage in several activities simultaneously and also change their activities frequently. How can we, as educators, understand this process of always changing activities while being in the midst of coaching students? We investigate this process by analysing coaching conversations we have with students in our course Clean Tech Launchpad. Based on the theory of complex responsive processes of relating and the participatory innovation construct ‘quality of conversation’, this paper discusses how design as a social activity around the business proposition takes place in the interaction between coaches and students. Therefore, we introduce the term ‘Quality of Entrepreneurial Design Conversations’. This local creation of meaning helps to design the business proposition development process of students.

keywords: quality of conversation; IDER; new venture creation; design entrepreneurship education

Introduction

The fields of design and entrepreneurship are getting closer together and overlap between the two field is appearing. The overlap is described both in terms of the theory and practice (e.g. Brown, 2009; Mata Garciá, 2014; Shah & Tripsas, 2007) and educational approach (e.g. Garbuio, Dong, Lin, Tschang, & Lovallo, 2017; Katz, 2003; Neck & Greene, 2011). More design education programs teach their students the possibility of choosing entrepreneurship as a career option (Kleinsmann, 2013). Simultaneously, more
entrepreneurship educations see the value of design in their educational programs (Neck & Greene, 2011). Especially Glen, Suciu, and Baughn (2014) call to find ways to implement design thinking in entrepreneurship education in a way that it adds to, instead of replaces, the more analytical tools and teaching styles that are traditionally found in business schools. Because e.g. Fiet (2001) argued that in entrepreneurship education, the main focus is on educating strategy, managing growth, idea generation, risk and rationality, financing, and creativity. This focus remained the same in recent years (Fayolle, 2013).

Some of these activities in the focus of entrepreneurship education can be captured under the umbrella of ‘design’, others can most definitely not. Fayolle (2013) also describes that in entrepreneurship education in recent years the theories of effectuation (Sarasvathy, 2009) and bricolage (Baker & Nelson, 2005) offer alternative views on how entrepreneurs think, make decisions, behave and act entrepreneurially in education. The work on effectuation and bricolage is also adding to the traditional tools of business schools. Therefore, we wonder how we can better understand what Glen et al. (2014) exactly mean when they talk about the added value of design in entrepreneurship education.

This paper will specifically explore how the field of design and entrepreneurship come together in the development of the business proposition in new venture creation. We will focus on how the transformation of the business proposition takes place. As Dimov states, the business development process in new venture creation can be described as ‘a creative product in entrepreneurship, [including] the progress (idea + action) along a continuum ranging from an initial insight to a fully shaped idea about starting and operating a business’ (2007, p. 720).

The aim of this paper is twofold. First, we will explore how design activities relate to other (non-design) activities in the business proposition development process. Second, we will empirically explore how design and entrepreneurship coaches and educators can engage and interact with students working on all these different (design and non-design) activities. For this exploration, we build on the theory of complex responsive processes of relating (Stacey, 2001) and quality of conversation (Buur & Larsen, 2010) in Participatory Innovation (Buur & Matthews, 2008). From these notions, we introduce the Qualities of Entrepreneurial Design Conversations to provide a new understanding on how coaches and educators engage in conversations with students working on the business proposition development of their new ventures.

The new Venture Creation Process as IDER Process

van Oorschot, Smulders, and Hultink (2016) described, based on the IDER model (Smulders, 2014), how the development of the business proposition in the new venture creation process can be described in terms of IDER activities. These activities are Initiation (I), Design (D), Engineering (E) and Realization (R) activities. All four activities extend beyond their definition within their discipline. I-activities focus on all ideation and exploration activities around the business proposition, in terms of users, markets and technologies. D-activities are identified as a conceptualizing activity in which entrepreneurs define the business proposition in a co-evolutionary way of developing the problem and solution space simultaneously (Dorst & Cross, 2001). E-activities aim at ‘robustinizing’ the business proposition, by testing and redefining the conceptual ideas as developed during the D-activities. Finally, the R-activities function as a bridge to get the
‘robustinized’ business proposition on the market, by setting up production lines, sales channels, finalizing contracts and so on. An important characteristic of the IDER model is that all activities take place simultaneously, but the proportions can change over time: from only initiation activities at the start, to a mix of Initiation, Design, Engineering and Realization activities throughout the process, to (almost) full Realization activities at the end of the new venture creation process. Visually, the IDER activities can be visualized in the model in Figure 1.

![Figure 1 Visual representation of the IDER model for the development of the business proposition](image)

van Oorschot, Smulders, and Hultink (2017 forthcoming) identified three different IDER patterns that new ventures go through when developing their business proposition. First there is a ‘standard IDER pattern’. The standard pattern is suited for new ventures that already know to a certain extent how they are going to Engineer their business proposition. Little attention is spent on the engineering of the business proposition, and most of the time and resources can go to designing and realizing the business proposition. Figure 2 illustrates an empirical example of a software new venture, which had to carefully design and redesign their business proposition, but knew throughout the whole process how to code and program (engineering activity) the newly designed elements.
In comparison, van Oorschot et al. (2017 forthcoming) describe a ‘wiggle IDER pattern’. The wiggle pattern is suited for new ventures that do not know exactly yet how to execute their engineering activities, and go through a so-called wiggle process of design and engineering activities. Figure 3 illustrates the wiggle process of an offshore new venture developing a large industrial application. The engineering knowledge to develop this application was not readily available, and thus the development was an interplay between design and engineering activities over a longer period of time, while also still initiating and realizing. After four ‘wiggles’, the entrepreneurs finally knew how to engineer the business proposition and more realization activities could be undertaken.

Finally, van Oorschot et al. (2017 forthcoming) describe ‘the R-drop’. They concluded from their empirically data that some new ventures have the tendency to too quickly Design and Engineer their business proposition early on in the development process, and then
spend most of their time on Realizing the business proposition as fast as possible. But the entrepreneurs do then discover that they are not working on the ‘right’ business proposition. The example in Figure 4 illustrates the IDER process of a new venture developing a technology for the car racing industry. The new venture was able to quickly realize their business proposition, but then discovered that the technology they were using was not allowed in the car racing industry. They had to stop their realization activities and start to spend more time and resources on redesigning the business proposition.

Figure 4  An empirical example of an R-drop in the process of business proposition development

Implications for educating student in their business proposition development process
The research of van Oorschot et al. (2016, 2017) illustrates how the activity of designing is an integrated activity in the business proposition development process of new ventures. At any point in time, entrepreneurs are Initiating, Designing, Engineering and Realizing their business proposition. It depends on the kind of new venture and the context of the new venture what kind of pattern of IDER activities is best suited. As well, unexpected situation will always occur which will force the new ventures to change their design and non-design activities.

In coaching students in starting their new venture and developing their business proposition, educators need to find how ‘design’ enriches the educational process as Glen et al. (2014) suggest. It is often unclear how the process will unfold and how much time the students should spend on redefining the problem and solution (designing) of their business proposition, and how much they should initiate, engineer and realize their business proposition. This leads to the question what the exact role of a design and entrepreneurial coach and educator is in the business proposition development process of students.
Complex Responsive Processes of Relating

To better understand the role of the entrepreneurial educator and the value of their coaching in the IDER-processes of the students, we draw on the work of complex responsive processes of relating (Stacey, 2012; Stacey, Griffin, & Shaw, 2000) The work of van Oorschot et al. (2016, 2017) seems to be based on the rationalist teleology in which new ideas are born in the mind of individuals (the (student) entrepreneurs (e.g. Davidsson, 2015; Shane, 2003), who can just take up the idea and run it through the right IDER-activities to shape it with the help of coaches. Stacey (2012) argue for a transformative teleology in which novelty constantly emerges in human interaction. Stacey (2012) build on the work of Social Behaviourism (Mead, 1934). The main philosophy is that “if we want to understand actors, we must base that understanding on what people actually do” (Mead, 1934, p. 18) van Oorschot et al. (2016) also touched, as Mead (1934) would suggest, on the complexity of a multi activity interplay of IDER activities at any moment in the development process. However, Mead takes a rational social point of view by stating that “the individual mind can exist only in relation to other minds with shared meanings” (Mead, 1934, p. 5). It is in the social act of communication that meaning is created. Mead describes how we perceive the world as the “means of living” (Mead, 1934, p. 120). It is for example only in perceiving ‘eating’ that we perceive the concept of ‘food’. It is in social and action driven communication that we make sense of the world.

Stacey et al. (2000) took up Mead’s notion and applied it in organizational theory to describe how to understand an organization as human interaction. In this human interaction, gesturing cannot be seen independently from responding. Instead of a sender/receiver model to transfer ‘already existing thoughts’ (Shannon & Weaver, 2002), Stacey (2007) argues how we change our own intentions constantly and that novelty is created in the interplay with others’ intentions. For coaching students, this means coaches do not simply transfer our knowledge and ideas in the process of new venture creation. Instead they create ideas about understanding the process of business proposition development in interactions with the students in gesturing and responding to each other.

An organization (a new venture) that develops the business proposition, does not exist as a system with the mere goal to develop the business proposition, but rather as the sum of local interactions (Stacey et al., 2000). It is in the sum of local interactions that the business proposition emerges. This view on new ventures has implications for educators and coaches. As Griffin and Stacey (2005) state, ‘no one can step outside of their interaction with others,’ and thus the role of entrepreneurial educators and coaches becomes a rather paradoxical one. Coaches are ‘officially’ not part of the new ventures that are created by the students, but at the same time they do become part of the interactions during coaching sessions with students and thus coaches are part of the new venture at that very moment.

Building on the work of Stacey, it is only in hindsight that we can produce visualizations such as those in Figure 2, 3 and 4, to illustrate the activities of the new ventures over time. In the midst of our actions, both students and educators will be Initiating, Designing, Engineering and Realizing all the time, but following Stacey’s notion, these are not defined activities yet at the moment of interaction between students and coaches. Instead Stacey
(2012) would argue for the creation of meaning in local interaction that allows the organisation (the new venture) to move forward.

**Quality of Conversation**

Buur and Larsen (2010) applied the logic of complex responsive processes to the process of design and innovation projects. Buur and Larsen aimed to better understand what is going on in conversations between stakeholders in design and innovation projects. They coin the term *Quality of Conversation* and explain that:

‘Conversations may lead to innovation when:

1. *Crossing intentions are allowed to surface*;
2. *New themes emerge in the interactions between crossing intentions*;
3. *New, vigorous concepts emerge that resonate with participants’ own experiences*;
4. *There is a spontaneity that allows participants to imagine new roles*;
5. *There is an ongoing discussion and readjustment of goals*; and
6. *Facilitation is exercised within the circle of participation, rather than from ‘outside’. ‘* (2010, p. 136)

Buur and Larsen (2010) explored quality of conversation in Participatory Innovation (Buur & Matthews, 2008) projects, in which stakeholders from several organizations (e.g. small, large, industry, government) and disciplines (e.g. design, engineering, sales, marketing, manufacturing, policy) come together to work on innovation projects.

In our own experience of educating students, we noticed that our conversation with students have similar qualities of conversation. In the work of Buur and Larsen (2010), stakeholders come together to work on future projects with stakeholders that are not yet defined and where there is not always a clear way forward. In our situation, we work with students on their new ventures that do not yet exists and there is also not always a clear path to success. In our daily experiences, we also see how for example crossing intentions are constantly playing a role, and how we as coach sometimes become part of ‘the circle of participants’. However, there are also differences between participatory innovation projects and new venture creation processes by student entrepreneurs. For example, participatory innovation projects take place in industry, while our students are starting their business in industry, while still being in the environment of the university. As well, there is a clear difference in budget, resources and relations between the two.

In the empirical part of this paper, we will explore if we can provide an understanding on the business proposition development process, which is based on the quality of conversation, but focused on the business proposition development process. This leads to the research question of this study:

*Being inspired by Quality of Conversation, what Qualities of Entrepreneurial Design Conversation can we identify in the process of educating and coaching students in developing their business proposition?*
Clean Tech Launchpad: coaching students
To develop our understanding of ‘Qualities of design Entrepreneurial Conversations’, we analyse coaching sessions of our master-degree level course Clean Tech Launchpad in which students develop a high tech new venture. A high tech new venture means that the business proposition is based on the exploitation of a technological innovation or innovative application of existing technology, and that the new venture is facing substantial uncertainty in terms of its development (Burgel & Murray, 2000). The requirement for students to participate in the course is that they work in a team with other (student) entrepreneurs, and that they already took first steps in the development of their business proposition development process. In terms of a IDER process we aim at student teams that are in the highlighted area as shown in Figure 5.

Figure 5 Students in the course find themselves in the highlighted part of the IDER model

Figure 5 illustrates that the course is mostly Design and Engineering focused with the aim to ‘sharpen’ the business proposition and to get the students ready to engage in more Realization activities later on. At the same time, figure 5 illustrates that the students are working on all I, D, E and R activities at any moment in time.

Twenty teams of 2 to 5 students per team applied for the course, of which nine teams were selected to join the course, based on how ‘developed’ their business proposition already was. Table 1 provides an overview of these teams and a description of their venture.
Table 1  Overview of the nine teams taking part in the course

<table>
<thead>
<tr>
<th>New venture</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerospace</td>
<td>New technology to build a space shuttle</td>
</tr>
<tr>
<td>CSR Money</td>
<td>Service to assist companies with their Corporate social responsibility budgets</td>
</tr>
<tr>
<td>Design Jobs</td>
<td>Job searching platform specifically for designers</td>
</tr>
<tr>
<td>Food</td>
<td>New way of delivering food</td>
</tr>
<tr>
<td>Hospital Aid</td>
<td>Service to help doctors to explain treatments to patients</td>
</tr>
<tr>
<td>Plastic</td>
<td>New technology to separate plastic waste</td>
</tr>
<tr>
<td>Toothbrush</td>
<td>New technology in tooth brushing</td>
</tr>
<tr>
<td>Virtual Reality</td>
<td>New technology in virtual reality gaming</td>
</tr>
<tr>
<td>Water Bottle</td>
<td>New technology for clean drinking water in a bottle</td>
</tr>
</tbody>
</table>

The course itself consists of two elements. First, entrepreneurship experts gave lectures every four weeks on an important element of new venture creation processes. These experts have entrepreneurial experience themselves and developed and realized several business propositions on their own. All experts are now working for academic research institutes while doing consultancy work with new ventures.

The experts gave lectures on the topics of (1) Business propositions (2) Prototyping (3) Financial projections (4) Pitching and (5) Scaling up. The experts provided a three-hour interactive lecture on the topic, including practical examples and asked students to apply the theory to their own ventures.

The day after the lectures we had individual coaching sessions with each team. The expert would also join these coaching sessions. The coaching sessions would last about 45 minutes per team. Additionally, we invited another team to join each coaching session, and we asked them to act as ‘advisors’. In this way, we enriched the liveliness of the conversations by bringing in the voices and critical thinking capabilities of other students.

In the coaching sessions, students and coaches applied new insights from the lecture and reflected how these insights could help to develop their business proposition. At the end of every coaching session each team developed action points to work on during the next weeks. All coaching sessions were video-recorded. After the coaching session, students delivered a report reflecting on the coaching session, they wrote what they learned from the coaching sessions and how it would impact their business proposition development process. The coaches took notes during all coaching sessions and also wrote reflections after the sessions.

**Method**

Based on our experiences during the coaching sessions, our reflections, the reflections of the students and the video recordings, we aim to identify qualities of entrepreneurial design conversation. Following the work of Stacey (2012), we are searching for what Stacey would call ‘striking moments’. Moments in the coaching conversations in which we
as coaches notice that something interesting is happening, but we cannot truly grasp yet why they are interesting and how to explain them.

Anderson (2006) suggests to be both convert and opportunistic in analysing one’s own experiences. Convert in the sense to follow a pre-set research agenda, which is in this case to look for situations that show similarities with the qualities of conversation as described by Buur and Larsen (2010). Opportunistic in the sense that the researchers allow themselves to describe social situations which would not necessarily fall within the pre-set research agenda, but are still ‘striking’.

Once we have identified these striking moments, Flyvbjerg (2001) suggests to ‘let the data speak’. By looking into the video recordings of the coaching sessions and analyse the reflections of the students we provide a rich description of what happened in the local interaction. In the findings section of this paper we will present five qualities of entrepreneurial design conversation that were striking and could be clarified by analysing the video recordings of the coaching sessions.

**Findings**

**Content and Process**

A first striking moment happened in the first coaching session with the Design Job team.

*Coach 1:* Creating resumes [for designers] might not be as scalable as you think it might be.

The coaches and the students discuss if the business proposition of the Design Job team is scalable. The coach assumes it is not, but at the same time the students and the coaches come to the realization that the students have a lot of insights and access to relevant resources because they created this first business proposition. However, some more redefining is needed to find the right business proposition.

Later in the coaching session:

*Coach 2:* This might be one of this rare instances where you are your own target group.

*Design Job Student 1:* That would be great! And we can also easily have contact with our friends.

The students start their reflection report with the sentence:

*The main insight gained during the meeting was that we shouldn’t focus on the status quo of applying for a job.*

The discussion in the first coaching meeting led to a new product-market combination that the students would focus on throughout the rest of the course. The business proposition became quite different from the business proposition that the Design Job team used in the application for the course.

We as entrepreneurship coaches find ourselves on the edge of being educators and consultants. We educate our students but at the same time the ventures the students are working on are very real, and the students make direct impact into society with their new
venture. Schein (1999) describes that process consultancy should be about the process and has to be seen separated from the content. In the field of design and innovation, Buijs (2003) also argues to only focus on the process and leave the content to the participants themselves. We only allow students teams to join the course when they have a business proposition that is already partly tested. But still, we find ourselves giving advice to the students on the content of the business proposition instead of merely coaching them in regard to their IDER process. Instead of telling students to engage in more Initiating and Designing activities to redefine their business proposition, we as coaches Initiate and Design with them. This first quality of entrepreneurial design conversation is that coaching happens both on the IDER process and on the IDER content.

Readjusting Common Beliefs

Another interesting situation we find in a discussion about how the social and entrepreneurial landscape look like. The entrepreneurial experts have between 10 and 30 years of experience working as entrepreneurs. However, what worked for them in the past, may not work in this place and time. One instance is in a coaching session with the Water Bottle team with the CSR money students observing.

Coach 1: I am myself a little bit sceptical, but I am supposed to be, that families of four are going to rent these. But on the other hand, they only go on vacation once per year.

Water Bottle Student 1: But when it is cheap...?

CSR Money Student: I would buy it and use it, why not?

The coach indicates that he does not see value in renting out a water bottle solution, for hygienic reasons he would see this product as something that you own yourself. However, the water bottle team is getting support from the CSR Money student:

CSR Money student 2: But what if I would get the product right away from the travel agency?

Water Student 1: Oh yes, especially in remote areas that would make sense.

Coach 1: Sounds like a good idea... in theory.

Towards the end of the coaching session, the coach is concluding this part of the discussion:

Coach 1: Okay, I would just like to see you to prove me wrong.

The coach is still sceptical about the product and how to introduce the product to the market. But at the same time, he is not shutting down the discussion by saying that this is never going to work at all and that they should not go for it.

The coach is seen as a true expert by the students. An expert who made a lot of money with his ventures, and thus a negative advice from his side would strongly influence the students. The students from both teams created a future scenario together that they would see working out in reality. The role of the coach is two-sided here. At the one hand, he is a process expert. But at the other hand he is also a potential user who gives his user
feedback on the idea. Just because he does not like the idea as a user, does not mean this student team could not do it. The readjustment of common beliefs of the expert is something that we constantly see taking place, which allows to move the process forward. This point can be summarized as coaches and students take up both the role of expert and user and allow to be challenged by each other.

**Student/Entrepreneur Goals**

In the coaching session after the Prototyping lecture, it is not clear to the expert what the students of Virtual Reality are actually working on. Not even after he has read the description of the team, or after the students presented a first mock up prototype of their idea.

*Coach: Can you show me a picture of what the hell you are doing, because I was kind of getting it but I wasn't.*

*Virtual Reality Student 1: yeah, I know...*

This is an example of what we have seen with more teams. Students have an abstract idea in their minds on how they are going to change the world, but the idea did not boil down yet to a business proposition. When the coach asks them to show a concrete picture or drawing of what they are doing they cannot do it. At the same time these students were already involved in conversations with potential customers and partners. In IDER term, these students were focusing on only the ‘Initiating element’ and the ‘Realization element’ of the business proposition.

For this team, it is the first time they are involved in a course where they work on their own business. The students took part in other innovation courses but the innovations they developed always stayed rather conceptual. In the Clean Tech Launchpad course, choices made in the class room setting become very real outside the class room, in their own venture. This influences what kind of goals the students set for themselves during the course.

To clarify this point, in a coaching session with the Food students, one of the coaches gets rather upset when the students show a plan on how they want to get customer feedback on their business proposition.

*Coach 2: This is the same plan [on approaching customers] as you showed us two months ago.*

*Coach 1: Can you also tell us about the insights you got from the customers in the mean time?*

The students could not show this, because they had been working on the plan for the last two months. In other courses in their master program they had recently learned to set up good guidelines for customer interviews. The students wanted to apply this knowledge as good as they could in this project.

What follows is a discussion between the coaches and students about the amount of time the students should spend on defining their concept on paper and how much time they can actually spend outside talking with potential customers. To develop the business proposition, only initiating and design activities are not enough, student need to start to
realize certain aspects of their business proposition already early on in the process. Realizing their business proposition in this stage of the business proposition development did however conflict with their students’ goals to develop their customer interview skills. Students and coaches do not always agree what would be the best goal to work towards. Especially since the students find themselves on the edge of taking a course and setting up a venture. To which extend should the business proposition be developed on paper but with high academic standards, and to which extend do student engage in real conversations with potential clients and partners that may or may not lead to development of the business? We as coaches cannot determine which of these two choices is best for the learning development of the students. Stacey (2007) talks in this respect about ‘enabling constraints’. The students set learning goals for themselves that constrain them in the business proposition development. On the other hand, setting the student goals is the only reason that enabled the students to take the Clean Tech Launchpad course in the first place and start to develop their business proposition. This is a paradox that cannot be easily resolved by coaches, but need to be dealt with in the midst of coaching the students.

Buur and Larsen (2010) talk about There is an ongoing discussion and readjustment of goals as one of the characteristics for quality of conversation. In our conversations with students there is also a readjustment of goals, but we can describe the phenomenon more precise. By building on the notion of ‘enabling constraints’ we can redefine the quality of entrepreneurial design conversations as: Student goals are enabling constraints for entrepreneurial goals.

**Entrepreneurial Roles**

A striking moment happened during the third coaching session with the Plastic students. The plastic students developed a new technology to recycle plastic. The students are explaining how they came up with a clever way of getting in contact with a potential partner. They approach the company as if they would be a customer to get information.

*Plastic Student 1: I am acting like I am a customer, but [student 2] is not involved in those meetings, so he can then later contact [the potential partner] and negotiate a deal.*

*Coach: But I imagine this will be a chained industry structure, the sales representative will not be the same one as the ones who produce machines. They are most likely not even the same company.*

*Plastic Student 2: Not sure...*

The conversation continues for some time on how the structure of the market looks like and who they should contact first. After the coaching session, the students write in their reflection report:

*We learned to ask ourselves an important question. Who is the user? Who is the buyer? Although they might be the same, we need to identify the needs for both users and buyers and define the market size for both.*

Three months later, the students presented their work at the final presentation of the course and talk about how they manage all these different relationships.
Plastic Student 3: [plastic student 2] is the tough negotiator of our team, so far he got through every secretary on the phone. [...] [plastic student 1] on the other hand, is our analytical thinker and defines the strategies to approach.

It was never directly stated by one of the coaches that roles have to be decided on. But through discussions on who the user and who the buyer is, the students started to realize that they cannot do all elements of the business proposition development with all of them together. They started to take up roles, relate to their own roles, and present their roles to others. Students find themselves in the struggle of taking up roles in their new venture. We as coaches cannot predict which role will fit which student best. But by relating the roles of the student to the development of the business proposition, we get into conversations in which students will start to define their role over time. Next to designing the business proposition, students and coaches are designing the roles that each of the actors enacts, related to business proposition development. Therefor we can say that students try out new roles while discussing their experiences with the coaches.

Financial Meaning
Finally, we noticed how the students struggled with the financial aspects of their business proposition. It is hard for them to develop a meaningful understanding on how the numbers come together and how their business will be viable over a longer period of time. Some instances during the coaching sessions might offer some openings for coaches and students.

This situation is an instance in the financial projections coaching sessions with the Food Students.

Coach: Back in Boston you would have to pay a delivery guy 15 dollars per hour to deliver this.

Food Student 1: I am quite sure it is less here.

Coach: you have to figure that out.

Food Student 2: But we can also ask customers to come and pick it up.

This conversation illustrates an instance where the students have little knowledge about the basic financial aspect of what they would have to pay their partner (the delivery guy). However, since the discussion does not go deep into the mechanics of the financials, it does allow the students to think about different kinds of business models.

A similar conversation takes place during the coaching session with the Aerospace team.

Coach: But seriously guys, how much money do you need for this?

Aerospace student 1: Yeah true, that is millions.

Aerospace student 2: But for separate parts of the product it would be less.

Here a similar conversation followed as with the Food students, in which several other business propositions are developed to sell in earlier stages. The students are not ready yet to have a deep understanding of the financial projections, but conversations about
financial projections do however help to sharpen the business proposition. Instead of developing their very ambitious project of a space shuttle, this conversation lead to the realization that maybe they can first develop parts of the space shuttle and sell these parts. The students would also not have the money to develop separate parts, but at least they do have the knowledge.

These are two examples of snippets of conversations where a financial aspect (which is a Realization aspect according to van Oorschot et al. (2016)) lead to a change in the design of the business proposition. By thinking less in terms of Ideation, Design, Engineering and Realization activities and more in a way of how a local conversation can move the development forward, the students are in the end let towards better design of their business proposition. In our coaching, we can see this contrast most clearly when we coach students about the financial aspects of their business proposition. Therefore, we name the last quality of entrepreneurial design conversation: **Financial discussions are used for business proposition development.**

**Conclusion**

How did the students continue their work? Did their new ventures succeed? For now, it is too early to say that. The students are still working on their new ventures, some of the students do it fulltime now, others while still finishing their education. Our education and coaching has served to interact with them in the process of business proposition development and has served the academic world to explore how conversations obtain a quality that makes movement in the process possible.

Based on careful analyses of the videos of our course we can make the suggestion that **Qualities of Entrepreneurial Design Conversation** means that:

- *Coaching happens both on the IDER process and on the IDER content*
- *coaches and students take up both the role of expert and user and allow to be challenged by each other*
- *Students try out new roles while discussing their experiences with the coaches*
- *Student goals are enabling constraints for entrepreneurial goals*
- *Financial discussions are used for business proposition development*

In line with Buur and Larsen (2010) we believe that the ‘**Quality of Entrepreneurial Design Conversation**’ becomes crucial if we aim to support business proposition development. It is at the start of the business proposition development process, and in hindsight, that describing the process in terms of IDER activities is useful and the different patterns that van Oorschot et al. (2017) describe become meaningful. However, while being in the midst of coaching students, we suggest to understand the phenomena of business proposition development by emphasizing the creation of meaning in conversations of educators and students. By doing so, we also start to better understand our involved role as design and entrepreneurial coaches and educators in our ongoing conversations with students in their business proposition development process.
References


About the Authors

**Robin van Oorschot** is a doctoral candidate in entrepreneurship education focusing on the educational value of design in entrepreneurship.

**Frido Smulders** is an associate professor and educational fellow in design, innovation and entrepreneurship focusing on the development of practice relevant theory.

**Erik Jan Hultink** is a professor of new product marketing focusing on launch and brand strategies for new products. Furthermore, he is head of the department Product Innovation Management.
This page is intentionally left blank.
Learning about others: Developing an interdisciplinary approach in design education

KAYGAN Pınar* and DEMİR Özümcan

Middle East Technical University, Turkey

* Corresponding author: pkaygan@metu.edu.tr
doi: 10.21606/dma.2017.51

Recently we witness a rising interest in interdisciplinary collaboration in both industrial design and engineering education. Since developing technology and innovation invites more complex design problems that are usually beyond the professional skills and competences of a single person, learning how to work in interdisciplinary teams becomes a central concern within the undergraduate programs of these fields. With the aim of contributing to interdisciplinary design education, this paper explores a four-week extra-curricular education activity called Interdisciplinary Design Studio (IDS) that was carried out at Middle East Technical University. The empirical data comes from the accounts of the students who participated in the IDS, from the Departments of Industrial Design, Architecture, Mechanical Engineering, Electrical and Electronics Engineering, Metallurgical and Materials Engineering, Computer Engineering, Industrial Engineering and Business Administration, who came together in six interdisciplinary teams to develop innovative products following the stages of a design process. Drawing on their accounts the paper seeks to answer two questions: First, how and in what ways students learned about other disciplines; and second, to what extent and how these learning experiences shape their approaches towards developing ways to collaborate with people (both tutors and students) from other disciplines.

keywords: design education; interdisciplinary collaboration; teamwork; design project

This work is licensed under a Creative Commons Attribution-NonCommercial-Share Alike 4.0 International License.
https://creativecommons.org/licenses/by-nc-sa/4.0/
Interdisciplinary design education

Recently considerable emphasis is placed on interdisciplinary collaboration in both industrial design and engineering education. It has been suggested that professionals who do not experience interdisciplinary cooperation during undergraduate education have difficulties in working with their colleagues from other disciplines (Itkonen et al., 2009). Considering that developing technology and innovation invites more complex design problems that are usually beyond the professional skills and competences of a single person, learning how to work in interdisciplinary teams becomes a central concern within the undergraduate programs of these fields (Feast, 2012; Dykes et al., 2009; Yang et al., 2005). Equipping students with integrative and collaborative skills in addition to discipline-based specialised skills is considered to be an important objective of education, as students would develop an understanding of different disciplines and would be able to collaborate more efficiently in the work context (Corkery et al., 2007; Britton et al., 2015).

There are various categorisations of interdisciplinary collaboration, all focusing on different aspects of interdisciplinary relations. Depending on level of integration, role distribution and work dynamics, Steiner (1998, as cited in Epstein, 2014) describes four collaboration patterns for interdisciplinary work: distributed, complementary, family and integrative. Each pattern proposes higher level of integration and more flexible role distribution than the previous one. Distributed collaboration is informal and voluntary, based on exchanging ideas and knowledge. In complementary collaboration, individuals combine their own disciplinary knowledge and skills with others’ in order to complete the work. During family collaboration, people undertake interchangeable roles, which usually go beyond their disciplinary expertise. Integrative collaboration is considered to be an ideal form of collaboration, during which the collaborators have a shared vision and collectively work to realize that vision. The roles that individuals would undertake depends on the aim of the project as well as people’s experiences and skills rather than their disciplines.

Peralta (2010) suggests that Steiner’s four categories can be implemented to investigate the collaboration between designers and scientists as it opens up a discussion on division of work and participant engagement. Aligned with his categorisation of interdisciplinary collaboration, exploring architecture, engineering and construction students, Fruchter and Emery (1999) suggest an assessment methodology to evaluate cross-disciplinary learning experience. This methodology interprets cross-disciplinary learning as a journey, which consists of four stages presented in a continuum: islands of knowledge, awareness, appreciation and understanding. At the state of islands of knowledge, students only have expertise and experience in their own domain. It is followed by awareness, when students become aware of the goals and limitations of other disciplines. Then at the state of appreciation, students go beyond bare awareness, develop an interest in knowing more about other disciplines’ perspectives, concepts and priorities, and start to ask meaningful questions. The ultimate state is understanding, when students participate in and contribute to discussions by being able to use the language of other disciplines. Reaching to the state of understanding is presented as the main objective of any interdisciplinary educational program.
Together, these studies highlight the need for exploring interdisciplinary education as a continuous learning experience that consists of different states, each with a different level of involvement, different role distributions and different learning objectives. With the aim of contributing to this body of literature, this paper investigates students’ learning experiences in a four-week extra-curricular education activity called Interdisciplinary Design Studio (IDS) that was carried out at Middle East Technical University Design Factory (METU DF). Within this scope, its research questions are twofold: First, how and in what ways students learned about other disciplines; and second, to what extent and how these learning experiences shape their approaches towards developing ways to collaborate with people (both tutors and students) from other disciplines.

The paper begins by describing the research context. Then, it moves to the research design, explaining the methods used for data collection and analysis. Next, it presents the findings in two separate sections, which are followed by the concluding discussion.

Research context
IDS is the first activity of METU DF, an interdisciplinary research and education centre for product development and prototyping, which started its activities in 2015. The premise of METU DF is providing the space and production infrastructure to create an inspiring and encouraging environment for interdisciplinary collaboration for both faculty and students from various disciplines. The first IDS, which is examined in this paper, was organised as an extra-curricular educational activity, brought students from different disciplines together in interdisciplinary teams to work on design projects. It was designed and carried out by an interdisciplinary team of 12 faculty members, three of whom from the Department of Industrial Design, one from Architecture, one from Mechanical Engineering, three from Electrical and Electronics Engineering, one from Metallurgical and Materials Engineering, one from Computer Engineering, and two from Business Administration. The faculty members contributed to the IDS by both directly teaching through the seminars and workshops, and providing feedback on the projects in the mentorship sessions. In addition, two faculty members took administrative roles, and one of them also participated in the IDS as a tutor with an expertise in interdisciplinary teamwork. There were also two graduate students who assisted the IDS.

The first author of this paper was among the IDS tutors, and concurrently carried out a research project on interdisciplinarity in the IDS with the students. The second author supported the research project by doing participant observation throughout the four weeks. So, as a research team, we could follow the ways in which students developed their projects in the IDS from a close distance.

The IDS was carried out in 2015 fall and lasted for four weeks. It brought 42 students from different disciplines together to develop innovative products. In the IDS, there were nine students from the Department of Industrial Design, seven from Architecture, six from Mechanical Engineering, six from Electrical and Electronics Engineering, nine from Metallurgical and Materials Engineering, one from Industrial Engineering and four from Business Administration. Among these, there were both undergraduate and graduate students, but the majority consisted of the third and fourth year undergraduate students.
Throughout the four-week IDS, the first week was designed as the meeting and training week. During the first week, seminars and activities on interdisciplinary collaboration, design process, speed networking, business models, user research and idea generation took place. Students formed their teams after they met in the speed networking session. It was followed by a mind map session where they discussed their expectations from the IDS and the project topic, which was stated as emergency. In total, they set six teams, in which there were not more than two students from the same department to ensure interdisciplinarity.

The following weeks were expected to correspond to the three stages of the design project: conceptual design, detailed design and finalisation of the project. During these weeks, teams worked independently. At the end of each stage, teams made a presentation to share their progress and to get feedback from the tutors. In addition, during these three weeks, mentoring sessions were organised at lunch breaks. In these nine sessions, which took place on Mondays, Wednesdays and Thursdays, student teams were expected to ask their questions to tutors about their projects.

Overall, there were three forms of learning-focused face-to-face interaction between tutors and students. The seminars and workshops in the first week, the mentoring sessions, and the presentations at the end of the three project stages. In the IDS, faculty members identified their role as “mentors”, rather than “tutors”, and made themselves available beyond the mentoring sessions to make an appointment and give feedback to the teams that need help about a specific aspect of the project.

**Research design**

The empirical data comes from our research with the students who participated in the IDS. There are two main sources of data. The first one is the interviews conducted with students both during the IDS, starting from first week conducted in each week, and after the IDS. We carried out 51 interviews with 29 students who volunteer to take part in our research. In the selection of our participants it was important for us to understand the perspective of the students from all disciplines, and to include at least three students from all teams. Overall, we interviewed nine students from the Department of Industrial Design, four from Architecture, six from Mechanical Engineering, three from Electrical and Electronics Engineering, three from Metallurgical and Materials Engineering, one from Industrial Engineering and three from Business Administration.

In the interviews we asked students to reflect on their learning experiences in the IDS. Rather than asking specific questions, we offered them the ground on which they could share their approach towards interdisciplinarity, design and teamwork in an educational project. The interpretation of their relationships with the IDS tutors as well as their teammates was crucial in developing an understanding of their learning experiences.

The second source of data is the written answers students have given to the weekly feedback assignments that we sent them via email. In these assignments students were given a set of questions, which changed every week according to the stage of the project as well as our observations on the process. In the first week, we asked (1) students’ roles in the team and how those roles changed during different activities, and (2) their prior expectations from the IDS and whether those expectations were met. Questions of the
second week include (1) a general inquiry about the IDS asking students to comment on the process by providing information about motivations, challenges, roles and relationships with team members/mentors, and (2) a question that asked the things they learned about themselves during the process. In the third week, we asked how teamwork was going, whether their role in the team was changed by time and the challenges they faced during the IDS. The feedback assignment of the last week specifically asked (1) what students learned about the facilities of different departments such as labs, workshops and machines, and (2) whether they build sustainable relationships with the tutors.

In total, 32 students responded to at least one of these weekly question sets. These were seven students from the Department of Industrial Design, four from Architecture, five from Mechanical Engineering, six from Electrical and Electronics Engineering, eight from Metallurgical and Materials Engineering and two from Business Administration. Conducting interviews at the beginning of, during and after the IDS, and collecting feedback through weekly question sets helped us investigate how and to what extent the students’ assumptions regarding and expectations from other disciplines have changed in time.

In the analysis we adopted a thematic approach, and coded both the interview transcriptions and weekly feedback assignments. The themes were derived through the exploration of students’ reflection on learning about other disciplines and their approach to interdisciplinarity within the team as it evolves throughout the IDS. Quotes that would best illustrate our findings were selected and anonymised before they are presented in the paper. As the disciplinary backgrounds of the students are significant to contextualise the quotes, at the end of every quote we noted the department of the student to whom it belongs.

Step I: Learning about other disciplines
In line with our expectations from an interdisciplinary interaction, our findings confirm that throughout the IDS, students have learned about other disciplines via both the seminars and workshops, and student teamwork. They, however, identify their interactions with tutors and peers as two different types of learning experience. Overall, students foreground learning from peers over tutors as a more effective way of understanding different disciplinary perspectives, as we will demonstrate in the following sections.

Learning from tutors
As mentioned above, in the IDS there were three types of learning-focused face-to-face interaction between tutors and students. All of the students were already familiar with the first one, listening to the tutors in seminars and workshops. The other two forms of interaction, getting feedback in the informal mentoring sessions and the more formal team presentations at the end of the three project stages, however, were not common in the pedagogical approach of every participating discipline. For instance, whereas one-to-one critique-based studio education constitutes the basis of the industrial design and architecture disciplines, it was a new form of learning interaction for most of the engineering and business administration students.

Our findings show that in the seminars, tutors have generally discussed the topics that were completely new for the students from other departments. In these seminars
students were exposed to other disciplines that they are not familiar with. In the following quote, an architecture student narrates how the seminar by a tutor from the Department of Business Administration opened a fresh window to a discipline that previously she did not know much about:

I was impressed very much from it. It was like... It was about the marketing strategies of the brands. When I thought about it I realised that it was something I had never thought about before. I found that very interesting. It was like such a beautiful discipline it was, such beautiful things these guys were learning, such practical stuff. (Architecture student)

While the main role of the seminars and workshops in learning about other disciplines seems to make a brief introduction to the participating disciplines, students did not seem to consider themselves directly “learn” from these seminars and workshops. Rather, the seminars and workshops offer a different and fresh way of looking at the world; thus, provide the students with a chance to “discover a new vision”.

Overall students expressed positive feelings regarding the seminars and workshops carried out by the tutors. Yet, they remained more critical about feedback sessions while evaluating how useful they were for their design processes. According to the students, the goals and expectations of the tutors from different disciplines were neither clear nor common.

It was around the second week, the tutors were providing critique, like, do this, do that, some suggestions... It was like the tutors didn’t have a full command of things... they didn’t have a common denominator or objective. Everybody had their own interpretation about the studio. They hadn’t decided about it, and that was interesting. We were receiving stuff from everyone in a different direction. (Architecture student)

This finding explains students’ low participation in mentoring sessions, and their avoidance of getting regular feedback from the tutors. Particularly in the third and the fourth weeks, we observed that only few teams were present during the sessions. In response to our questions regarding their poor attendance, students stated that the different disciplinary perspectives they encounter in the mentoring sessions caused them to get confused and lose their direction as a team. As a result, they quit attending the sessions and discussing their projects with the tutors.

To tell the truth, because our tutors were all from different disciplines, their feedbacks confused us, in general, instead of illuminating. [Due to this confusion] we had difficulties in deciding how to proceed. (Mechanical engineering student)

In a studio where all participating tutors were encouraged to contribute equally, it was inevitable for the tutors, to emphasise different priorities in our feedbacks. As tutors, we did not find this problematic; we identified this as openness and flexibility, and expected the students to take all these different perspectives in, digest them and address in their design solutions. However, students seemed to prefer a more focused design perspective. Their accounts show that they need the tutors to speak one voice, which would tell them
how to proceed in every stage. This is probably due to the fact that the IDS was the first
time students encountered an interdisciplinary tutoring team, in which every tutor would
focus on and question different aspects of a design project.

In spite of the fact that students do not consider that seminars, workshops and mentoring
sessions had a particular impact on their learning about other disciplines, they underlined
the value of the networking opportunities created by these activities. They indicated that
they were happy to have a list of academics from various fields at the end of the IDS, so
that when they need to consult people from these fields, they would have a name to
contact. Therefore, regardless of whether the seminars, workshops and mentoring
sessions directly contributed to their design process in the IDS, they served to develop an
interdisciplinary network with academics for their prospective postgraduate studies and
professional relations.

Learning from peers
While learning from tutors mainly corresponds to gaining new visions regarding other
disciplines, students placed much emphasis on discovering disciplinary differences to
explain how they learned about other disciplines throughout their collaboration within the
team. Disciplinary differences were discovered around three issues: first, the meanings of
similar concepts; second, priorities in a design project; and third, learning environment
and relations.

Same concepts, different meanings
Students stated that at the beginning of the design project, they realised in the team
discussions that despite using the same concepts, design and engineering students
referred to different processes. The first time they discovered these differences was the
mind map assignment given in the second day of the IDS. In this assignment, teams were
asked to visualise their approach to the design process. Working on the assignment,
students had a chance to discuss the basic concepts from different disciplinary
perspectives. Design, and design problem and design process in relation to it, were the key
concepts that were central to these discussions:

[In engineering] there’s that thing, you’re already given a problem and
there are some suggested ways to solve it. [In design], the problem also is
abstract. For example, emergency can be anything. There’s a much
broader point of view. Like, I approached to the problem as chronical
emergency, then this and that happens. The result can take an entirely
different direction according to your approach. We [engineers] don’t have
that flexibility. (Mechanical engineering student)

The engineering student highlights that in engineering design process, problem is
predetermined, whereas industrial designers have flexibility to define their own design
problems. An industrial design student confirms the same comparison, observing that
conceptual design phase, which is the initial phase of the design process, is missing in the
definition of design from the engineering perspective. She says,

[For engineers] there’s no conceptual design phase. Actually, design is still
making something, drawing, producing. It has a similar meaning in
engineering, too. But they don’t have conceptual design phase at all.
Especially they might have a prejudice towards producing something from scratch. They don’t have an idea of creating a concept from scratch and actually making it happen. For them, the concept of design corresponds to revising. (Industrial design student)

Like design, concepts related to production, such as model, mock-up and prototype were also mentioned frequently by the students to be highly differently understood in the design-related disciplines (industrial design and architecture) and engineering disciplines. While in engineering education the primary aim of physical models is to test whether the design works or not, in industrial design education models are not always the end products of the projects, rather they are elements of the creative process. They are not always expected to ‘work’, i.e. they do not have to include the working structure or mechanism, and they can be made out of cardboard, clay and foam. Along with paper sketches, physical models in various scales are used by the designers throughout the whole design process to externalise their ideas to explore ideas and concepts, to think through doing, and to empathise with and get feedback from the user, etc. (Vyas et al. 2009). At the end of the mind map assignment, students have discovered these two disciplinary approaches with different expectations from models:

I learned that [engineers] make one model! We told that we make lots of models and choose among them. They only make one that gives the correct answer. They have one product and make changes on them. We make plenty and choose from them. (Industrial design student)

Although students encountered the different expectations from models in the first week, negotiations on the concepts of production, prototype and model remained in some of the teams until the last stage of the project, when students worked on the physical model of their design to exhibit in the final presentations:

In production, for instance, we say we need to manufacture this. [Engineers] say how and so, etc... What we mean by production is making a model (laughs). I guess they think you know... They say, ‘Are we really going to manufacture this?’ We say, ‘No, not really, we meant the model’. For us, manufacturing is not immediately putting something out to the market. (Architecture student)

Priorities of the disciplines
In the first week, during the lunch breaks students had an opportunity to start informal discussions on their motivations for participating in and expectations from the IDS. During these discussions, we observed that engineering students often referred to the typical aesthetics-functionality dualism as they talked about the relationship between design and engineering disciplines. This dualistic view, which is underlined within the literature to have a detrimental effect on the professional relationships between engineers and designers/architects (Faulkner, 2007; Kaygan, 2014), seemed to strongly shape their presumptions regarding the priorities of the design-related disciplines in a design project. We encountered the aesthetics-functionality dualism in the early interviews with engineering students, as well:
I would say [understanding of design in design-related departments] is more aesthetical. But in terms of functionality [engineering] design is more useful, it satisfies people’s need more. I can say that [design], on the other hand, is more about satisfying the need of pleasure. (Mechanical engineering student)

In another first-week interview, an electrical and electronics engineering student explains in what ways he expects his teammates to contribute to the design project, comparing industrial design and architecture students to engineering students. He suggests that at the beginning of the project engineering students will develop the project, then designers would create a “shell” to complete the product. Doing this, he delineates a sharp division of work between the two disciplines: engineers are responsible for how the product “works”, and designers for how it “looks”.

Interviews show that in some teams this dualism further dominated the discussions on the priorities of each discipline, implying hierarchy between these priorities. In the following quote, a business administration student says,

When [the mechanical engineering student] said, “This is art”, we joked like, “Art? At least he could say aesthetics.” He says, “For me, that machine is important, doing that job is important.” Designers say, “But come on, aesthetics is also important for the user. What is the point if it can’t be used easily?” But the engineer insists, “As long as the job is done, then it’s OK.” At that point I couldn’t hold it anymore: “If I can’t sell it, it doesn’t work at all.” (Laughs) I brought my management thing to front and couldn’t bare the discussion. (Business administration student)

The business administration student is frustrated by the engineering student’s insistence on arguing for the superiority of functionality over ‘art’, and intervenes by underlining the primary concern of her discipline: whether the product can find a place in the market or not. Doing this, she aims to show the engineering student a third disciplinary perspective, which can “beat” functionality.

As evident in the business administration student’s account, however, in response to the aesthetics-functionality dualism, industrial design students in general highlighted user (rather than the aesthetic appeal of the product) as the main concern. It was a shared assertion by industrial design students that while from their disciplinary viewpoint, user is at the heart of design, it is never an issue in engineering design. The below quote narrating the mind map assignment illustrates this:

We had a conflict. For example, they said, “I’m designing a gear case for a car. Actually I’m not doing something for the end user. The end user, the one who buy the car, doesn’t see it.” But we, [designers], directly interact with the end user. That’s why we conduct user observation or user testing. On this topic we had a conflict. What we understand from design is the one for the end user, but it’s not the same for them. They sometimes understand design as working of one part of a machine. (Industrial design student)

Learning environment and relations
When the IDS began, the DF building was not ready to use yet. To create a quick and temporary solution, a couple of studios and seminar rooms within the Faculty of Architecture were allocated for the IDS. These places were used during the seminars and workshops in the training week, mentoring sessions and presentations. Thus, for the learning activities in which mentors were involved, suitable places were booked. Apart from these, students did not have a dedicated studio where they could meet as a team and work together on their projects. As a result, students had to develop their own solutions for coming together, considering the convenient place for all team members. Both the accounts of the students and our observations revealed that students preferred to come together at the weekends and mainly in the industrial design studios, which can be accessed by the industrial design students in the teams. In addition to the industrial design studios, however, some of the teams also visited the buildings of other departments towards the end of the IDS. Particularly at the prototyping stage, students visited other departments to use the labs and workshops.

Our findings show that by visiting other departments’ buildings throughout the IDS, students discovered how educational approaches and environments can differ in various disciplines. In the undergraduate education, studios, which can be accessed 7/24 and which are used by only one level of a single department, constitute the main learning environment of the industrial design and architecture students. For the engineering students, on the other hand, classes for large numbers of students, labs and workshops constitute the main learning environment. As they saw each faculty’s physical environments and had a chance to spend time in these buildings, students discovered connections between the differing design and project approaches and the educational settings of various disciplines.

Students’ accounts on the differences in educational environment mainly focused on describing the informal workspace culture within the Faculty of Architecture. A mechanical engineering student, for instance, describes how surprised he is to observe that the studio-based design education much more flexible in comparison to the class- and lecture-based engineering education:

*Now, we always work in [industrial design fourth year studio]. There’s nothing like a lecture there, there is no concept like this. We, [engineers], definitely enter the lecture at 40 pasts and classes finish at half pasts. And [since they don’t have set hours], [designers] don’t have things like ‘being late’. People are free. They are given [a project] and they work on it.*

(Mechanical engineering student)

An industrial design student also compares the lecture-based formal learning culture to studio-based informal learning culture:

*For example, one evening my friend from materials [engineering] came. Actually, our jury was going on. There were the last two students. He lowered his voice and asked, “May we enter?” I said, “Of course, come on!” It’s because that’s very different from their understanding of ‘class’. There we were talking about [our IDS project] and the jury was still going on. They found it strange.*

(Industrial design student)
Discovering the disciplinary differences in the educational environment, industrial design and architecture students consider themselves privileged to have the studios where they can get access 7/24. They state that studios are like their home, since they do not only offer the space to work, but also host the informal and enjoyable relationships among the classmates. Through this, studio-based learning culture supports the sense of belongingness and community within the faculty building:

*Here we create an environment for ourselves as students. They don’t have this. They take their lecture and it finishes. This is how they’re studying. [...] In the first week we had a need for paper. The stationary was closed. I said, “I’m sure there’re some at one of the studios.” I went to a studio, opened a drawer and yes, there was. They were saying, “Don’t take it, how easy manner is this!” But because [studios] became like our home. Because I’m sure when we leave something there, someone else also takes it.*

(Architecture student)

Moreover, students suggested that the disciplinary approaches to education in design-related fields and engineering are also influential on different student-tutor relations:

*In mechanical engineering, you can graduate without a professor knowing your name. You take classes, get an average grade, you graduate. None of the tutors know your name. But in design, tutors are like your mentors. You conduct a project, make something, she comes and evaluates it, advises you, do this, don’t do that kind of. I mean the mindset is different in these two departments. One is like mass production [education] and the other is more like a handmade.* (Mechanical engineering student)

Both their interaction with the industrial design tutors who participated in the IDS and their observations in the industrial design and architecture studios provided engineering students with an opportunity to discover the nature of tutor-student relationships in this environment. Since studio education is based on regular critique sessions and jury evaluation that require intense one-to-one interaction, compared to their own disciplines, they witness a closer and relatively less formal relationship between tutors and students in design-related fields. Drawing on a conversation with her engineer teammates, an architecture student says,

*They were really surprised to hear that we were Facebook friends with our tutors. “How can you have such a relationship?” Because unavoidably a network is established with the people from your department. I observed that it isn’t the case for them.* (Architecture student)

To sum up, our findings show that whether being surprised or frustrated, students went through an intense learning experience during the IDS. As they discovered the perspectives, vocabularies, goals and constraints of other disciplines, they have moved along the continuum suggested by Fruchter and Emery (1999). Students started the IDS within the category of *islands of knowledge*. Yet, as their accounts clearly demonstrate, they gained awareness in time and to a certain extent began to appreciate the priorities of other disciplines. In the next section, we will present the findings on the overall reflection.
of students on developing a shared understanding on which they could build their design projects.

**Step II: Developing an understanding of interdisciplinarity**

So far we have demonstrated how during the IDS, students had an intense interaction and collaboration with other disciplines through which they discovered the disciplinary differences. Having gone through a series of conflicts and negotiations, student teams managed to find a way to work as an interdisciplinary team and developed a shared understanding. Learning about other disciplines and figuring out how to work together seem to help them to develop an understanding of interdisciplinarity in four ways, as we discuss below.

**Shift from multidisciplinary to interdisciplinary collaboration**

Comparing multidisciplinary to interdisciplinary collaboration, Richter and Paretti (2009) state that the former is an additive process, while the latter involves synthesis. Both our observations and the students’ accounts confirm that during the course of four weeks, the collaboration between students evolved from multidisciplinary to interdisciplinary. During the first weeks of the IDS, students expected to complete certain tasks related to their own discipline and hand on the project to another student from a different department, yet soon they discovered how to develop ideas and create something collectively. In order to explain this transformation, a mechanical engineering student uses the analogy of production line:

> We, people from different disciplines came together and did something. But that thing [way of working] disappeared [in time]. For example, you’re a designer, do your design, then we’ll take it from you and give it to the mechanical engineer. It isn’t like that anymore. There’s a product and everyone gives input to it. We’re no more like a production line.

(Mechanical engineering student)

While the process was initially interpreted as a linear one, during which the disciplines contribute to the project separately, it turned into a collaborative process, during which the knowledge, ideas and skills of each discipline are synthesised to reach a common goal. Experiencing this shift from multidisciplinarity to interdisciplinarity, students discovered their very own understanding of interdisciplinary collaboration.

**Flexibility in division of work**

Once students developed an understanding of interdisciplinary collaboration, they also began to think more critically about how to work as a team and how to divide work among team members. The accounts of the students revealed that they tend to divide work according to their interests and abilities rather than assigning tasks simply based on one’s department. Going beyond disciplinary boundaries, students contributed to the project not only by using their disciplinary knowledge and expertise, but also by doing what they would like to do or what they are good at. For example, one of the teams preferred to present their final product in a stop-motion video. It was a self-initiative of one of the team members, who had an interest in making stop-motion animation. Then some of the team members volunteered to join him, and they prepared the final video collaboratively.
Similarly, a materials and metallurgical engineering student shares how she was not limited to her own discipline, but could contribute to different areas:

*We divided work and split into groups according to our interests and skills. We became even more and more satisfied with our project and that’s why we continued idea exchange with enthusiasm. We don’t care about our departments so much. For example, instead of telling me “You’re a materials engineer, deal with the materials”, they ask me what I would like to do. (Materials and metallurgical engineering student)*

Although occasionally students question undertaking different roles and responsibilities, our findings show that, overall, they are happy with this flexible approach to division of work. Not having predetermined roles, either as a member of a discipline or as a leader/follower, seems to enhance their appreciation of collaborative work. Working on various team exercises enables students to discover how to complement each other with their background in different disciplines.

**Contribution to self-development**

Students commonly argued that experiencing interdisciplinary collaboration not only increases the overall quality of the project, but also contributes to their self-development. As they took different roles within the team in relation to the given tasks, they realised that disciplines are not entirely distinct in terms of their approach to design and project. Instead, some understandings of a discipline may apply to another one in a way that widens the vision of that discipline. A mechanical engineering student explains how he gained a new vision as a result of his interactions with an industrial design student:

*What was good about [working with the industrial design student] is that she taught me the parts I didn’t know. I haven’t thought of making apps before. I also liked things like our logo, which were her designs. Stuff like that complemented my shortcomings. I mean I didn’t have such a vision, I have such a vision now. That’s good. (Mechanical engineering student)*

During the IDS, students had a chance to approach problems from different perspectives. Both working with the students from different departments who have various perspectives, and undertaking different roles and responsibilities within the team helped students to develop new understandings and thus, broaden their perspectives. The following account illustrates how being introduced to new dimensions during the IDS, enriched the way a student approaches to a design problem:

*During the [IDS], I realised how cultural and artistic points of view suddenly removed the curtains before me. I understood that I used to mistakenly think that art and aesthetics was only a cultural accumulation and I didn’t realise their effect on my technical abilities and my life. Really, instead of approaching to a problem straight, I learned and I’m still learning approaching it from “n dimension”, considering the inside, outside and around. During this event, thanks to aesthetics, sociocultural and artistic points of view added extra three dimensions. I used to look at things as one dimensional, technical, but now I consider four dimensions that I can*
describe as technical, aesthetical, sociocultural and artistic. (Mechanical engineering student)

Sustainable interdisciplinary relations
During the interviews, students put emphasis on making friends from other departments. It is commonly believed that having an interdisciplinary network of friends is a valuable opportunity. Students mentioned that they could consult the people from the IDS whenever they need expertise from a certain discipline. Besides, some of the students stated that they would like to collaborate with those people in future projects. The experience of an interdisciplinary collaboration seems to change students’ perceptions of collaborating with other disciplines in a positive way. An industrial design student puts it:

Now, I have one friend from electrical engineering, two from materials engineering and one from business administration, from whom I can get ideas whenever I got stuck. Thanks to interdisciplinary collaboration, I manage to give different ideas a chance and understand them. It was a perfect opportunity to break down the prejudices. It helped me to understand the ideas built on different grounds better. (Industrial design student)

Overall, the students openly shared their intentions for sustaining their relations with both their team members and the other participants of the IDS. Our observations also confirm this finding. Once the IDS has finished, most of the teams remained in contact and some of them worked on projects that were independent from the IDS.

Conclusions
This paper investigated an extra-curricular interdisciplinary design studio to understand students’ learning experiences during an interdisciplinary activity, where they learn about other disciplines, and to explore how these experiences shape the ways in which students collaborate with others. Drawing on our findings, we highlight three conclusions to offer new insights regarding curriculum development of interdisciplinary courses in design education.

First, in the IDS, most of the learning about other disciplines and the ways of interdisciplinary collaboration occurred beyond tutors’ supervision and control. Although the seminars and workshops carried out by the tutors enabled students to gain new visions regarding other disciplines, their progress from the category of islands of knowledge to understanding of interdisciplinarity is achieved mainly by peer learning within their design teams. In the interviews, students stressed the significance of the mind map assignment as they told us the stories of how they discovered differences between the priorities and vocabularies of participating disciplines. Through this assignment, team members found the opportunity to discuss the basic terms such as design, design problem and model. They began to gain an awareness and appreciation of how a design project may consist of different stages (for example, explorative stages are not common in engineering design, and iterative models accompany all stages of the design process in industrial design) as well as how some main concerns at the centre of design approach in a discipline, such as user and use context, can be missing in the design approach of another
discipline. Although to some extent these discoveries triggered frustration and conflict among team members, they eventually constituted the basis of an intense learning experience that led to a shared understanding.

This finding underlines the significance of creating team assignments that would encourage students to open into debate their disciplinary perspectives, priorities and constraints. It can be argued that this kind of debate would naturally take place throughout the whole collaboration process. However, as we demonstrated in the above sections, an assignment that requires students to produce an outcome to be submitted serves as a particularly good opportunity to, first, reflect on and describe their disciplinary stance, and second, identify the similarities and differences with other team members’ perspectives. While designing curriculum of interdisciplinary design education, therefore, it may be a better strategy to work on how we can reinforce peer learning by providing teams with dedicated time and structured discussion tasks.

Second, as discussed before, since during the IDS, the DF building was still under construction, students did not have a dedicated space to work on their projects as a team. They mainly used the industrial design studios, and towards the end of the project, visited the labs and workshops of other departments as well. As tutors, during the IDS we observed that the lack of a dedicated space had a challenging effect on teamwork, since it caused difficulties in arranging time and space for meetings, and storing project materials during the process. The importance of having a specifically-designed workspace for interdisciplinary collaboration has received considerable acknowledgement in the existing studies (Björklund et al. 2011; Fixson, 2009). It has been suggested that particularly open and pressure-free spaces that encourage informal relations among team members play an important role in fostering team creativity (Magadley and Birdi, 2009; Vyas et al., 2009).

Even though both the literature and our observations confirm the challenges caused by the absence of a dedicated workspace, our findings revealed that during the IDS this disadvantaged situation was transformed into a learning opportunity. By visiting different departments and spending time in various learning environments, such as studios, labs and workshops, students discovered the learning culture of different disciplines, including the nature of tutor-student relationships prevalent in these cultures. This helped students to build links between learning culture and disciplinary perspectives. Considering how it enhances students’ understanding of interdisciplinarity, during an interdisciplinary design education, whether there is a dedicated space to work or not, it may be useful to encourage students to visit and spend time in other disciplines’ learning environments.

Third, although there were students from seven different disciplines, in the interviews students particularly focused on the disciplinary differences between industrial design and engineering. Students’ accounts seem to repeat dualistic views on designer-engineer relations, which have a great detrimental effect on interdisciplinary relations in professional life (Kaygan, 2014). The typical aesthetics-functionality dualism revealed itself persistently throughout the project. Industrial design students clearly indicated that they prioritise the user by putting more emphasis on user’s needs, interests, and preferences during the discussions taking place at the idea generation and product development stages. However, engineering students often referred industrial designers’ concerns as aesthetics-related and tended to position these against functionality, which is the main
concern of the engineers. Although there were students from four different engineering departments, the disciplinary differences among engineering departments were not bring into discussions, and engineering is contrasted to industrial design as a single discipline. Drawing on these findings, we suggest that despite the presence of various disciplines, the relationship between industrial design and engineering is still the most problematic one during an interdisciplinary collaboration. Although, the IDS helped students to develop an understanding of different disciplines, the aesthetics-functionality dualism remains too strong to be challenged and to open room to new concepts such as user and use context in a four-week project.

Acknowledgements
This paper is based on a research project funded by Middle East Technical University (Project number BAP-08-11-2016-006). We would like to thank our colleagues Arsev Umur Aydinoğlu and Selin Gürdere for their contribution to the research project.

References


**About the Authors**

**Pınar Kaygan** is Assistant Professor in Industrial Design, Middle East Technical University. Her research interests are creative work and workplace; interdisciplinary relations, collaboration and teamwork in design education and practice; critical aspects of design management, including gender, hierarchy, power relations.

**Özümcan Demir** is Research Assistant and PhD student at Middle East Technical University, Turkey. Her research interests include interdisciplinary collaboration and teamwork, organizational/occupational culture, design management, contribution of design to innovation process with focus of design thinking and service/system design.
This page is intentionally left blank.
Gamifying design education

OBERPRIELER Kerstinab*; LEONARD Simonb and FITZGERALD Robertb

a ThinkPlace, Australia
b University of Canberra, Australia
* Corresponding author: Kerstin.oberprieler@thinkplace.com.au
doi: 10.21606/dma.2017.79

Designers are increasingly in demand in a range of context because of their ability to deal with complexity and develop innovative solutions. Educational practice, however, is not yet on par with the multi-disciplinary and multi-modal learning style of today’s students. Gamification offers the promise of an innovative approach to engage students and produce better learning outcomes. The challenges facing gamification designers are parallel to those of experience designers, chiefly in ensuring the solution is contextually and personal relevant to the user. Learning design thinking, however, is a complex social activity influenced by myriad contextual factors. Cultural historical activity theory, when coupled with design-based research, offers a theoretical foundation that allows for gamification to be used for expansive education. The authors present The Four Orders of Gamification and a Gamification Design System that enables design educators to develop expansive curricula for tomorrow’s designers.

keywords: gamification; cultural historical activity theory; design education

Introduction

Design practice and design thinking have emerged in recent decades as a means for institutions, workplaces and individuals to engage with and work within an increasingly complex, trans-disciplinary and technology-enabled world. The design approach, however, has been relatively slow to penetrate curriculum and pedagogical (educational) practice, even for the education of current and future designers. Efforts and approaches such as problem-based learning are aimed to introduce design practice and thinking into the educational experience. However, these tend to be peripheral rather than central, and
there is a serious gap in our knowledge about what makes for successful problem-based learning environments (Jonassen, 2011).

‘Gamification’, like ‘serious games’ and ‘game-based learning’, is a more recent design-like arrival on the educational landscape with great promise to support the development of soft skills, transversal competencies and collaborative production (Engeström, 2001; Herrington & Reeves, 2011). However, the approach has attracted significant criticism due to many examples of the over-application of very simple game mechanics and a reliance on extrinsic motivation. In this paper we will argue that this limitation of gamification occurs primarily due to a lack of theoretical understanding of what gamified learning environments can and should achieve. Subsequently this means there is a lack of theoretically informed design tools for gamified learning environments. With reference to a case study from the literature, and to our own work in designing gamified learning environments as part of an educational design-research project, the paper will contribute to closing this theoretical gap. In particular, the paper will provide a reflexive discussion on how cultural historical activity theory (CHAT) can be used to inform the design of gamified learning environments. Before doing so, the paper will set out some basic concepts for our discussion.

The expanding use of design thinking
The field of design thinking has come far in recent decades. From John Dewey’s (1929) foundational concepts of delineating between science, art and practice, to Herbert Simon’s (1996) notion of ‘sciences of design’ and crafting preferred environments, the design process has grown from a largely product- and industrial focus to one which incorporates all manner of problems. As stated by Richard Buchanan in his influential Wicked Problems in Design Thinking (Buchanan, 1992):

> Despite efforts to discover the foundations of design thinking in the fine arts, the natural sciences, or most recently, the social sciences, design eludes reduction and remains a surprisingly flexible activity. No single definition of design, or branches of professionalized practice such as industrial or graphic design, adequately covers the diversity of ideas and methods gathered together under the label. ((Buchanan, 1992)5)

Design thinking is becoming an increasingly adopted approach beyond the traditional design fields and is, increasingly, a standard for businesses, not-for-profits and governments worldwide (Sobel & Groeger, 2013). This is due in part to the increasing relevance of wicked problems environmental, social and economic problems (Buchanan, 1992; Dunne and Martin, 2006) that are placing increasing pressure on organisations to be skilled in innovation (Dunne & Martin, 2006). The shifts required include mind-sets and styles of work that are collaborative, iterative and abductive (Dunne & Martin, 2006). These ways of working have been widely referred to as ‘twenty first century’ or ‘transverse’ skills (Beckerman & Barry, 2007; Guildford, 1967) and are increasingly seen in the curricula of educational institutions such as Stanford University’s D-School (Melles, Howard & Thompson-Whiteside, 2012).
**New knowledge and expansive ways of knowing**

Historically, knowledge has been seen as being disseminated by means of transferring possession of pre-existing codified factual knowledge to students (Burns & Paton, 2005). This concrete and unidirectional view of knowledge, however, is not sufficient for the twenty-first century student or worker. New domains of knowledge are being created at an ever-increasing rate and factual codified knowledge needs to be coupled with tacit performance knowledge (Burns & Paton, 2005). This is particularly so in design fields and is well summarised by Engeström (2010) when he argues:

> individuals and organisations are continually learning knowledge and skills that are not stable and defined, rather that are evolving and changing. In fact, the knowledge, skill and activity is being learned as it is being created.

Workplace learning in the design fields, therefore, need to evolve to remain germane and to produce skilled lifelong learners and workers for tomorrow’s economy. This begs the need for theoretical foundations and practical guidance for design educators to engage design students and develop relevant tools and mechanisms for the complex nature of modern knowledge generation, transfer and application. In order to engage design students and provide them with the skills, knowledge and experiences they need educational practice needs to be engaging, relevant, to foster collaboration and to embed design practices as part of the learning experience. Gamification is an emerging educational approach that has the potential to deliver such a learning experience (Buckley & Doyle, 2015; Gibson, Ostashewski, Flintoff, Grant, & Knight, 2015).

**Gamification as an innovative educational practice for expansive learning**

To begin our discussion of gamification, we offer a new definition on which this paper will expand:

> “Gamification is the use of game mechanics and experience design to engage users and solve real world problems”

In its most basic form, gamification is the use of points, badges and leaderboards to reward performance. It uses social status and team spirit to incentivise and reward desired behaviours. Other common mechanics and dynamics include gaining experience points, levelling up, questing, competition with other individuals and teams, chance, and receiving virtual and real rewards.

Gamification is distinct from games and game-based learning in subtle yet important ways. The first distinction to make is that between ‘play’ and ‘games’; play (paidia) being free-form behaviours based on improvisation and expressions, and games (ludus) being rule-based play with determined objectives (Kalinauskas, 2014). Games, both serious and for entertainment, are a form of activity that often use physical objects and interaction with other players (Deterding, Dixon, Khaled, & Nacke, 2011). Game-based learning is the use of games to promote learning and is used for knowledge- and skill-acquisition. In our use, the key distinction of gamification is the use of game mechanics to reward real-world behaviours – this need not involve an actual game (Deterding et al., 2011).

There are copious examples of basic gamification application to increase brand loyalty, including large companies such as Nike, Samsung, and McDonalds (Kuo, 2015; Rambo,
Gamification is also being applied in other spheres and is also being used in healthcare, environmental sustainability, public services and formal education settings (Hamari, 2013; (Morford, Witts, Killingsworth, & Alavosius, 2014).

### Closing the engagement gap

While still a nascent field, gamification has received much attention in education due to its promise to close the 'engagement gap' (Towers Perrin, 2008). Towers Perrin (2008) define engagement as the extent to which individuals put discretionary effort into their work and contribute energy, creativity and passion, in addition to understanding and performing their roles and responsibilities. Student engagement in educational contexts is similarly linked with academic performance such as higher achievement, higher educational attainment and decreased dropout rates (Griffiths, Sharkey, & Furlong, 2009). Many studies have found an alarming lack of engagement in schools and workplaces (Herrington & Reeves, 2011; Towers Perrin, 2008). Inspired by the success of the video game industry in engaging individuals to perform virtual tasks repetitively, gamification has seen marketers, organisational psychologists and education designers borrow elements of gameplay and the player experience and apply them to real world contexts. It is estimated that more than fifty per cent of organisations will have at least one gamified process and that the gamification market will reach $5.5 billion by 2018 (MarketsandMarkets, 2013).

Several psychological theories underpin the success of games and gamification in education. The most notable is behavioural psychology’s Self-Determination Theory (SDT) (Conway, 2014). SDT describes three core needs and incentives, namely autonomy, competence, and relatedness. Autonomy is the player’s level of choice and free will; competence is the skills required and gained; and relatedness it the feeling of connectedness to others. These needs are more likely to be met when the goals created in a game are intrinsic, or sought for their own sake, rather than extrinsic, or sought as a means to an end (Songer & Miyata, 2014). Another is Csikszentmihalyi’s concept of autotelic flow (Hektner & Csikszentmihalyi, 1996), a psychological state in which individuals are completely immersed in the activity to the point where they can lose track of time and physical needs such as food and even sleep. This state is achieved when a player’s competence and the challenge of the activity are aligned. The principles of autonomy, competence, relatedness and flow are well utilised in games, where players are guided or on-boarded into the game when they begin, and gradually gain competence as they aim for levels within the game. Each level becomes increasingly more difficult, and provides a new challenge for the player as they become more skilled and competent at the game. It is through these principles and mechanics that games and gamification can engage and motivate learners.

### An example of a gamified curriculum

The following example of a gamified science curriculum (Kingsley & Grabner-Hagen, 2015) demonstrates the power of replacing the current educational practices with a gamified one. The case study by Kingsley and Grabner-Hagen (2015) is a 4-week technology-based science unit that was replaced with a gamified one in a Midwestern metropolitan school, grades 5 and 6. Instead of the common lecture style and activities followed by an exam or assignment to test learning, the curriculum content was designed as a quest-based game.
Using a platform called 3D GameLab, the teacher designed the content as a series of quests for students to complete, who were rewarded with XP (experience points), badges and awards for completion. The content was provided in multi-media format and included teacher-created and external public information, such as Bill Nye’s ‘Phases of Matter’ hosted on YouTube. Students were able to select quests based on their interest and ability, instead of the traditional linear and fixed progression through content. Quests increased in difficulty as students ‘levelled up’ based on their XP. Students earned badges for progression through the quest levels, which were named to reinforce science vocabulary and concepts. For example, the first level of quests was centred around solid matter and students progressed through the states of matter as they levelled up through the curriculum, ending in sublimation.

The result of the gamified curriculum was an increase in engagement and learning, and a greater satisfaction with the educational experience as compared with traditional non-gamified design. Students reported that the quality of their work increased as a result of the gamification (87.2%) and that the content was easier to learn (82.9%). Students also reported increased motivation as a result of the self-regulation of content, with one student stating:

“I get to decide which lessons I want to do. In my other classes, I have to go by the teacher’s schedule.”

It can be seen that this gamification design utilises the principles of Self-Determination Theory and autotelic flow to achieve engagement. Through the gamified curriculum, students approached their learning as if it were a game, making the educational experience both challenging and fun. Allowing students to self-regulate and tailor their pace and content resulted in increased motivation and better learning outcomes. The process of transforming the curriculum into a gamified one is a design process itself. The curriculum is now a user-centred one, that empowers students and engages them in a manner congruent with their desires and expectations.

**Key questions for design educators**

The chief question then becomes how gamification can be used to create engaging curricula for design students. Several challenges in developing gamified learning need to be addressed. The first of these is that, despite its increasing popularity and application, gamification does not have a shared and evidence-based framework or process. Much like the field of design ten to twenty years ago, gamification is undergoing academic and practical debate regarding its definition, application, and process for creating desired futures.

Secondly, an important consideration and criticism is the over-application of simple mechanics, such as points and badges, which focus on extrinsic motivation (Conway, 2014). An over-reliance on these simple extrinsic motivators can have a crowding-out effect of intrinsic motivators, leaving players without internal motivation to pursue the target behaviour and activity (Hamari, 2015). The danger this creates is that the player focuses on the achievement and consumption of signs, such as more points or a new level, instead of the transformation of learning. This results in the cessation of the behaviour if the extrinsic motivator is removed.
As well as ensuring a mix of intrinsic and extrinsic motivators, gamification designers also need to ensure the design provides motivation for a range of user or player types. Different players achieve this state of flow under different conditions and for different intrinsic motivations. This is the notion of player types, or classifications of how players tend to interact with their real or virtual world. The most well-known classification is the Bartle Test, which classifies players into four main types based on their motivation and predilections (Kim, 2015). While there is some debate about the generalisation of Bartle’s four player types to different games and gamification (Dixon, 2011), the concept of understanding and designing for different player types is critical to all game and gamification design.

Design educators can be tempted to simply overlay existing behaviours with points and badges in attempt to use the power of gamification to create engaging learning experience. However, the challenge in gamified curricula is to ensure the experience is relevant and tailored to the specific learning context and for all actors in the system. The core challenge therefore becomes how to design a gamified learning experience that is contextually-relevant, caters for various learning styles, and produces meaningful learning outcomes for design students.

**Understanding learning environments through cultural-historical activity theory**

Just like other educational design, gamification design needs to follow a process rooted in design-based research to ensure the design is contextually relevant and achieves the desired outcomes. Learning design thinking skills is complex and as such requires an expansive view of learning. Cultural-historical activity theory and cognitive ecology offer such a perspective.

Learning environments consists of myriad of internal and external resources and interactions that can be likened to a biological ecosystem (Hutchins, 2010). Researchers in the nascent field of cognitive ecology have demonstrated that human cognitive processing and learning are embodied and enacted; developing through goal-orientated action and interactions between the human organism and its environment (Hutchins, 2010; Rueschemeyer & Bekkering, 2009). It follows, they argue, that individual learning happens as part of the environment, not in isolation from it. Learning is influenced and determined by the structure of the cognitive ecosystem surrounding the individual and learning occurs as a dynamic formation of particular practices within the ecosystem (Hutchins, 2010). This interaction between the learner and his or her context results in the simultaneous learning and creation of new forms of activity, known as expansive learning (Engeström, 1995). Expansive learning argues against this limited view of learning to be about the acquisition of skills and knowledge that have already been mastered and codified (Engeström & Sannino, 2010).

Similarly, cultural-historical activity theory (CHAT) emphasises the criticality of the environment in human learning and consciousness (Gustavsson, 2009). Pioneered by Vygotsky in 1920’s, CHAT is becoming an increasingly accepted theory in educational design because of its acknowledgement and embracing of the complexities of human learning (Roth & Lee, 2007). CHAT emphasises that learning is culturally mediated through artefacts, tools, and language. It states that consciousness and learning are mediated through the use of artefacts and are oriented towards goals or objects, as well as being
strongly situated in the local cultural, social and historical context. Cognition is therefore embedded in and inextricable from activity and local practice. Key elements of an activity system include the object, an entity or a goal which is continually evolving; the activity, a form of doing that is directed to an object, is goal-orientated and targeted to a need; mediating artefacts such as tools, signs and language; subjects, the human actors or participants in the system; community which consists of subjects that share an interest and involvement with the same object; division of labour, the roles within the community, including division of power and resources; and rules, which regulate the subject’s actions and interactions within the system.

An activity or learning system can be mapped on the CHAT triangle model, which provides a framework and method with which to understand the unique factors and interaction of the particular context in question, particularly when combined with a design-based research approach (Anderson & Shattuck, 2012; Yamagata-Lynch, 2007). The CHAT approach embraces and organises the particular components of the learning context, and in this way, can map the richness and multi-factored nature of activity systems. This richness of understanding is the key differentiator and value of using CHAT in the understanding, evaluation and design of learning systems.

![Figure 1 Cultural-Historical Activity Theory triangle](image)

**Developing CHAT-based gamified design education**

CHAT understands learning to be expansive, complex and social, thereby providing design educators with a non-linear understanding of learning. This expansive view of learning allows design educators to reframe the learning experience as a series of interactions and dynamics, and incorporate these into the gamified design curriculum. This activity system
approach to gamified design curricula requires a deliberate design decision about the extent to which gamification should be used.

**Reflections from an ongoing study**

The following conceptual models and frameworks presented here are part of an ongoing design-research project that is investigating gamification’s application to collaborative learning environments to foster high-order behaviours such as knowledge sharing, collaboration and building team culture. As this paper is a largely theoretical contribution, the details of the study will be presented only briefly here.

The study takes a mixed-methods and design-based research approach with the methodology detailed elsewhere (Oberprieler & Leonard, 2015). Building on Yamagata-Lynch’s (2007) work, this study incorporates design-based research with CHAT analysis as both a theoretical basis and a practical research tool. The immersive and iterative approach of this methodology has the unique strength of enabling locally-relevant and timely changes to the design that can more quickly lead to improved environments. In addition, the design principles and lessons learnt throughout the process can be generalised and add to existing theory.

The study is being conducted in strategic design consultancy, ThinkPlace Australia, and uses a gamified experience to incentive and reward particular behaviours in employees. These range from daily irritants, such as tidying the office and submitting timesheets, to higher order and important business activities such as writing proposals for project and sharing knowledge. These activities are framed as daily and weekly quests to complete, and employees are rewarded with points that count towards their team, and can be exchanged for goods. Other mechanics include badges for achieving milestones, weekly team rankings, team breakfasts for office-wide achievements.

The findings to date have shown a distinct change in behaviours since the gamification introduction. When the gamification is in play, timesheets and cleanliness increase significantly. One of the most significant changes in behaviour and culture is the active use of the company’s knowledge sharing platform, Bloomfire. This platform is important for building and sharing knowledge and intellectual property. Prior to the gamification, employees were slow to take up the use of this new platform, and finding IP and examples of work was difficult and relied heavily on verbal corporate knowledge. Sharing and engaging with new content was gamified, and the platform is now part of the daily activity of employees, used in the company’s offices in several countries, and it is a key resource for new employees as part of the induction process. The number of weekly uploads and the percentage of overall engagement (includes reading, commenting, downloading) is significantly improved from less than 20% to 58%. From a social and behavioural perspective, this practice has now become part of the discourse between employees, who now use the name of the platform is used as a verb. For example, if an employee speaks about a useful product or article, another employee will often ask ‘Have you “bloomfired” it?’.

While this study is ongoing, it demonstrates the potential of gamification to change behaviours and social interactions. This is for administrative tasks, but more importantly, for behaviours such as creating, sharing and engaging with new knowledge. The emerging
evidence of this study is that gamification can lead to expansive learning experiences that meaningfully change behaviour.

Systemic gamification
Developing a gamified design curriculum can be viewed as a design activity, because it uses design thinking principles and methods to create improved social and learning environments. Like design thinking, gamification can be applied to a range of contexts and to varying levels of complexity. Based on Richard Buchanan’s four orders of design (Buchanan, 1992), the authors present the Four Orders of Gamification. This model provides gamification designers with a framework with which to understand the type and extent of the gamification they are intending to design.

Ascension from first to fourth order is based on the complexity of the learning behaviour being gamified, the duration of gameplay, and the integration between the gamified and real world. This increasing complexity between orders also requires increased sophistication in the gamification design and mechanics. Design educators can use this framework to construct the mechanics and dynamics of their curriculum based on the order at which they wish to gamify learning.

The criteria for each order is based on the following categories.

- **Objective**: The behaviour the gamification design is aiming to influence and change, including the complexity, sociality and duration over time.
- **Rules**: The boundaries and challenges for the behaviours, ranging from simplicity and immediacy to complexity of interaction and sustained effort required.
- **Reward**: The nature of the feedback to players, including scores, levelling, currency and prizes.
- **Integration**: The amount of integration of the gamified system with its contexts, such as other people, other systems, and real world consequences.

First order: Playful design

- **Objective**: Application of game-like mechanics to attract attention, engage and have fun for a brief amount of time.
- **Rules**: None or very few.
- **Reward**: Immediate and limited to engagement for a short period of time.
- **Integration**: There is limited integration or effect.

Examples include visually designed objects, such as augmented reality posters and visual design that uses game mechanics to engage the viewer. The reward is instant and limited to being engaged sufficiently to attend to the content for a few minutes. Examples include The World’s Deepest Bin and Piano Stairs.
Second order: Basic gamification

- **Objective**: Use of gamification mechanics to incentivise and reward simple real-world behaviours. The behaviours targeted are relatively simple or uni-dimensional, and can largely be done individually, with social interactions such as sharing and commenting.
- **Rules**: Focused on frequency of simple behaviours, such as completing simple tasks.
- **Reward**: Simple, predominantly in the form of points, badges and leaderboards, and some form of virtual or real reward.
- **Integration**: Some level of integration exists, for example, ability to purchase items outside of the gamified system, and connecting on other platforms, such as social media sharing.

Examples include Nike+, Chore Wars and Zombies, Run encourage real life activities and behaviour through points, badges, leaderboards.

Third order: Interactive gamification

- **Objective**: Change or generate complex behaviours through gamification, including social interactions and multi-faceted tasks.
- **Rules**: Include collaboration with others and tasks that require cognitive and emotional effort, such as knowledge creation.
- **Reward**: Virtual and real rewards, as well as significant real-life benefits, such as habits, learning and building relationships.
- **Integration**: Integrated with other systems in the environment that impact the user’s real world experience outside of the gamified world.

Examples of ongoing gamified experiences that address complex behaviour is limited. SuperBetter is one example, which creates healthy habits by helping individuals to self-reflect and identity key behaviours they want to engage in on a regular basis.

Fourth order: Systemic gamification

- **Objective**: Change and create complex behaviour patterns that involve multiple interactions with others and the environment in which the gamification is situated.
- **Rules**: Emphasize challenging behaviors and working with others to complete difficult tasks that take weeks, months and years to complete.
- **Reward**: Extend to real-world rewards with significant impact on the individual.
- **Integration**: Substantially or fully integrated with the environment.

Examples here are also rare. The Kingsley and Grabner-Hagen (2015) gamified curriculum presented earlier, exemplifies fourth order gamification because it replaced the traditional school curriculum with a gamified world. Instead of grades, exams and teacher-directed lessons, students completed learning quests, collaborated and learned from others, and levelled up based on reaching self-driven competency attainment. As the field of
Gamification progresses and matures, systemic gamification will become more commonplace for education, career pathways in workplaces and more.

Fourth order gamification requires an understanding and embracing of learning environments as activity- and artefact-mediated ecosystems. It requires gamification designers to understand the complex behaviour patterns and interactions of the students in this ecosystem. The mechanics should be focused on higher order behaviours and how these change over time, i.e. months and years. The mechanics and rewards should be integrated substantially or fully with the environment, with rewards extending to the real-world and significantly impacting on the individual’s learning and growth. It is in fourth order gamification design that meaningful and transformative learning experiences can occur.

CHAT provides the means which with to understand and visualise fourth order or systemic gamification. A fully integrated gamification design is one in which all interactions in the system are gamified. Gamification therefore changes the activity system by changing the interaction between the elements in that system. For example, in a non-gamified learning system the exchange between the student (subject) and her peers (community) can occur naturally through conversation and individual motivation to interact and collaborate. In a gamified learning system that encourages and rewards collaboration, the exchange can occur more frequently, with more deliberation, and with more individuals as they are all rewarded, say through points or progression towards a collective goal or ‘mission’.

Using the CHAT triangle throughout the gamification design process allows design educators to map the learning experience and interactions; initially to understand the uniqueness of the context, then to design the gamified system to target the interactions, and finally, to measure the changes in learning behaviours and outcomes through changes in the interactions. Figure 2 shows the blue activity system overlaid with the orange gamified interactions, and how a fully integrated gamification design interacts with and changes all dynamics within the system to achieve both a learning and a game outcome.
Principles and gamification mechanics for expansive learning
Systemic gamification design requires a deliberate and careful selection of gamification mechanics to produce a meaningful and expansive learning experience for design students. The mechanics and dynamics selected need to promote goal-orientated activity for individuals in the learning system, and work together to provide a holistic learning experience that achieves learning objectives. The game components that require consideration include content and skills, mechanics, visual aesthetic design, narrative design, incentive system, and musical score, if required (Plass, Home and Kinzer, 2015).

Principles and mechanics to achieve expansive learning in systemic gamification can be defined into four categories.

**Situatedness**
The foremost requirement for systemic gamification is that the curriculum be relevant for the uniqueness of the learning environment or activity system as defined by CHAT (Engeström, 2010). This socio-cultural placement of the gamified learning increases relevance and meaning for the students (Plass, 2015). In their meta-analysis on effective game-based learning, Crocco et al (2016) found deep learning occurred when learning outcomes and game objectives and mechanics were aligned. The CHAT and design-based research methodology (Barab & Squire, 2009; Yamagata-Lynch, 2007) provides educators...
with the approach and tools to understand the learning context and design a gamified curriculum that aligns with it. This includes selecting content, narrative, incentive and visual design that aligns the learner’s values, desires and motivations.

**Adaptivity**

Plass et al (2015) state that adaptivity is the:

“capability of the game to engage each learner in a way that reflects his or her specific situation. This can be related to the learners’ current level of knowledge, to cognitive abilities, to the learners’ emotions, or to a range of other variables.” – page 260

This principle is critical to ensure a learner-driven experience and is supported by the self-determination theory need for autonomy (Conway, 2014). Allowing design students to choose their own content, difficulty level, customise an avatar and select rewards are beneficial mechanics to engage and allow organic interaction in the learning system.

**Socio-cultural interactions**

The social interaction between learners during the learning process has been found to increase retention of knowledge (Plass, Homer & Kinzer, 2015). Encouraging discussion, collaboration, seeking and giving help in the gamified learning context enhances learner’s affective, cognitive, behavioural and sociocultural engagement (Plass, Homer & Kinzer, 2015). Mechanics include social sharing, team quests, and gifting between design students.

**Meaning**

Successful systemic gamification requires a strong narrative and for the content to be reinforced through the mechanics and dynamics. The content needs to be integrated with the narrative and the learning outcome (Crocco, Offenholley & Hernandez, 2016). Mechanics include a narrative and visual design that reinforce the content being learned, including badges and rewards that relate to the learning and level of the player.

**The gamification design process**

Design educators need to employ these principles and mechanics when designing fourth order systemic gamified curricula. A process and methodology is needed to embrace the complexities of the learning context and use them in gamification design for expansive learning outcomes. Gamification is in essence the design of an experience, using game mechanics and other game elements to elicit particular behaviours. It therefore employs principles and tools used by experience designers. These include a user-focus, design based research and user ethnography, immersion in the context, prototyping and working iteratively.

The Gamification Design System presented by the authors here takes inspiration from the five phases in the ThinkPlace Design System and is adapted for the specifics needed for gamification design (ThinkPlace, 2016). It is an early prototype of a gamification methodology being developed as part of the aforementioned study.
The Gamification Design System takes a five-phased approach to the gamification challenge. The process is characterised by a transition from divergent to convergent thinking, beginning with exploration of alternatives and asking questions, and converting to critical thinking and choosing between alternatives to arrive at the final design (Guilford, 1967).

- **Phase 1 Intent** is about defining the desired future state for the behavioural and cultural change, and how this aligns with the learning and educational objectives.
- **Phase 2 Explore** clarifies the target learning behaviours and activities being gamified through design-based research and capturing the current cultural-historical activity system.
- **Phase 3 Make-Test-Learn** takes Lean Start Up Methodology (Ries, 2011) approach to creating a concept for the gamified solution, including choosing the best gamification mechanics, dynamics and components to reward the target learning behaviours. This involves mapping the gamification CHAT triangle, and iterating the design as using immersive and iterative design-based research methods, as well as usability and play-testing.
- **Phase 4 Launch** includes preparing the students for the introduction of gamification, and building engagement and excitement.
- **Phase 5 Evolve** is about monitoring and evaluating the gamification solution for effectiveness and experience. Depending on the scope and duration of the gamification, it can also include introducing new features.

**A staged process for the gamification of expansive design education**

The gamification design process is staged and question-driven, and supported by various design-based and CHAT-based research methods and techniques not presented here. The following process is an early version of a larger piece of work currently being undertaken.
The Intent phase encompasses key questions about the objective and learning outcomes of the curriculum.

- What are the learning outcomes for the design students? What knowledge, skills and experience are required?
- What learning barriers and challenges exist in the current design curriculum that we want to address?
- What are the success criteria for the gamified curriculum?

Phase 2 Explore uses design-based research to understand the students and the uniqueness of their particular learning context. The context is visualised using the CHAT triangle to make visible the unique interactions and design variables of this environment.

- Who are our users, including demographics, player type, engagement preferences?
- Which learning or design behaviours is the gamification targeting and why?
- What order of gamification are we aiming? For example, a simple gamified design of content or an integrated and transformed gamification curriculum?
- What challenges or constraints are we designing within in this particular learning context? Which cultural or multi-cultural aspects do we need to consider?

Phase 3 Make-Test-Learn is an iterative phase of hypothesis-driven prototyping and testing. The gamification mechanics and dynamics are prototyped at increasing levels of fidelity.

- Which CHAT interactions is our gamified design targeting, and how?
- Which mechanics, dynamics and components will be used to achieve the desired student behaviours?
- What narrative, visual and incentive design will resonate most with these design students?
- Which are core, important and peripheral? (musts, coulds, shoulds)
- How will players be onboarded and learning scaffolded?
- What are the feedback channels and what will be measured to understand effectiveness?
- Which behaviours are being more/less enacted? Are there any parts being ‘gamed’?
- If fourth order gamification, how well are the principles of situatedness, adaptivity, socio-cultural interactions and meaning being applied?

Phase 4 Launch occurs once the gamification design has been converged on, and focuses on preparing design students for the change in their learning experience.

- How will the in-real-life (IRL) benefits be communicated to design students?
- What support is required by the teacher in delivering the gamified curriculum?
- Who else needs to be engaged and involved during the gamified experience?

The final phase Evolve is about monitoring and evaluating the effectiveness of the gamification intervention in achieving the design learning outcomes.
• How has the gamified curriculum changed the learning experience in comparison to the traditional curriculum?
• Using the CHAT triangle method, which behaviours and interactions changed and how?
• If continuing the gamified curriculum over a long period of time, which new behaviours and activities should be added and when?

Conclusion
Gamification offers an innovative approach to creating expansive learning experiences for the next generation of designers. Design educators using gamification face several challenges when developing a gamified curriculum, chiefly, how to create meaningful experiences that go beyond basic game mechanics and results in deep learning. Taking an expansive and cultural-historical activity system view of learning provides design educators with a framework with which to understand and create for engaging learning experiences. This systemic gamification requires a deliberate design approach, which is presented at a high level here. The gamification design process introduced in this paper requires further development and refinement, including the integration of theoretical frameworks and practical tools. These frameworks and tools also require application to various contexts in order to provide evidence and evaluate its effectiveness. While gamification for education is still nascent, it holds promise for design educators to provide an expansive and contextually-relevant learning experience for tomorrow’s designers.

References


---

1629


About the Authors

Kerstin Oberprieler is a user-centred designer for ThinkPlace, lead gamification designer for PentaQuest, and studying her Masters by research at the University of Canberra, Australia. Her focus is on applying gamification to complex and social environments to create meaningful change.

Associate Professor Simon Leonard’s work is on learning sciences and education policy, focusing on scalable and sustainable implementation of innovation. Roles include ‘Educator in Residence’ at Questacon, Head of Teacher Education at the University of Canberra, and Associate Head of the INSPIRE Centre for Innovation in Education and Training.

Professor Robert Fitzgerald leads the INSPIRE Centre for Innovation in Education and Training at the University of Canberra. Robert’s current work brings together design thinking, educational design research and technology enhanced active learning to addressing problems of practice in diverse settings.
This page is intentionally left blank.
Educating Design Innovation Catalysts Through Design Interventions

HAMMEL Raphael and MOSELY Genevieve*

University of Technology Sydney, Australia
* Corresponding author: raphael.hammel@uts.edu.au

In the increasingly competitive and fast-changing business environment, innovation is a growing necessity. Organisations are seeking to leverage design as one way to deliver more value to their customers, although the use of design to innovate is still an emerging practice. Individual capability underpins organisational adoption of design and as such the role (education and training) of this individual is currently under investigation – coined the ‘design innovation catalyst’. This paper describes a series of design interventions in a case study of a cohort of fifteen participants in an Australian industrial sector, which aimed to provide the foundation to educate participants about the role of design innovation catalysts. Based on this case study this paper makes a series of observations and reflections on the experience of these design innovation catalysts, which form the basis for recommendations to improve the effectiveness of future programs.

keywords: design innovation; design interventions; design innovation catalyst; design-led innovation.

Introduction
The business environment is evolving, in a world where the rate of change is increasing and competition is becoming globalised (Lawrence, 2013). In this context, companies are constantly looking to transform, innovate and differentiate themselves in order to compete in a highly competitive, fast-changing and global market (Prahalad & Ramaskawy, 2004). In Australia, the past two decades have seen uninterrupted growth occur by an average of 3.4 per cent a year (Business Council of Australia, 2014). Maintaining such
growth over the next decade will be challenging in the face of global and local trends. Globally, businesses are facing technology shifts that enable new business models to emerge quickly and challenge incumbent players (Business Council of Australia, 2014). For Australian businesses, the rise of emerging economies in Asia can become a substantial threat to growth. As emerging economies develop, they move up the value chain and get in a position to compete and disrupt the incumbent players from advanced economies such as Australia (Business Council of Australia, 2014). In such an environment, Australian businesses would put themselves at risk if they solely focus on growing through a focus on productivity (Business Council of Australia, 2014). A new approach is needed to stimulate growth in this evolving market. This provides an opportunity for design to help guide organisations and sectors through a transformative change in order to meet the needs of the future.

Globally, design is increasingly being recognised as an approach to innovation for solving complex problems and as a way to create new value for business and industry when tackling wicked problems in volatile, uncertain, complex and ambiguous environments (Bucolo & Wrigley, 2014). Design can offer a different way of thinking, doing and approaching problems which is valuable for business as it is being seen as the key driver for greater productivity, more efficient and effective products and marketing leading to long-term business sustainability and competitive advantage (Wrigley, 2016). Previous research by Bucolo, Wrigley and Matthews (2012) has stated design-led innovation (DLI) is a methodology to compliment the undertaking of other approaches such as focusing on deep customer insights, which are expanded through customer and stakeholder engagements to explore possible solutions and approaches to innovation. Design-led innovation has the intention of increasing top line growth, and building capability ultimately leading to organisational transformation, therefore it was selected a methodology to assist such a sector as one approach to combat their larger issues.

As previous research has looked at DLI within an organisational context when dealing with sector level innovation it has been suggested that ability to scale can arise as one issue. (Peppou, Bucolo & Thurgood, 2016). Wrigley (2016) has introduced the design innovation catalyst to help implement DLI collectively across multiple organisations at once. However, there is still much to uncover regarding how this catalyst should be engaged, trained and upskilled through different design interventions. Therefore this paper seeks to address: how can a limited number of design interventions establish and educate industry-based professionals to become design innovation catalysts in their organisation?

**Design Thinking as a Skillset**

Design thinking as a skillset is used not only as a problem-solving technique but as a driver of innovation, particularly in the business context through delivering a competitive advantage (Dong, 2014). The process of design thinking is human-centred, creative, iterative and practical which develops differentiation and competitive advantage converting to market opportunity and customer value (Brown, 2008). Bucolo, Wrigley and Matthews (2012) describe the value that design thinking can bring to an organisation as a cultural transformation through re-framing problems, solutions and possibilities differently. Over the past decade, design thinking and its link to innovation have matured,
leading to its adoption across sectors to build capability, increase productivity and growth (Matthews, Wrigley & Bucolo, 2013).

However, a comprehensive understanding of design thinking needs to be developed in order for it to be most effective. An individual’s personal design capacity and capability and their ability to utilise design thinking for innovation are influenced by their mindset. Carlgren (2013) argues that building design capability requires focusing on developing the mindset as well as tools and techniques. This is echoed by Howard, Senova and Melles (2015) who state “presenting design thinking as a skill or tool set leads organisations to consider and use design thinking in this one particular way without understanding the nuances of how to apply design thinking in practice” (p. 186). Collins (2013) develops this notion further, believing that design thinking should be viewed as a paradigm shift within the organisation rather than a replication of processes and methodology to solve problems as this has resulted in a low commercial success rate (p. 39).

The individual’s mindset to the approach of design thinking when building design capability is discussed little within the literature and there is a limited understanding of how this mindset is developed and fostered (Howard, Senova & Melles, 2015). As this appears to be an important factor for cultural organisational transformation to occur through DLI it raises questions of how this can be built and advanced within individuals, especially within the design innovation catalyst.

**Design-led Innovation Interventions**

Design interventions are implemented to assist organisations in becoming design-led in order to develop long-term organisation culture transformation for competitive gain. Interventions by definition are intended to make something better, the word intervention is derived from the latin word *intervenire* meaning to come between or interrupt.

A review of the literature revealed limited, explicit definitions of what a design intervention is, however, all were consistent that the interventions lead to design being adopted into the organisation’s business as usual. Bucolo and Mathews (2011) relate design interventions to the Danish Design Ladder framework (Kretzschmar, 2003) stating the goal of design interventions “is to enable companies to shift their perspective on the value of design and therefore move back up the ladder over time, from negligible attention to design, to design being critical to the company’s success” (p. 4). Niinimaki, Person, Pekkala and Peltonen (2014) state “design interventions are about equipping companies with the knowledge and competence needed to start using design in their development activities by exposing them to the work practices of designers” (p. 1845). Both explanations are consistent with design interventions being implemented within organisations to facilitate the incorporation of design to lead to innovative practice.

Mestre (2015) developed a design action intervention approach, which was characterised by “experimentation, participation and the development of understanding” (p. 190). Through the development of this approach, Mestre explains that “more and more design researchers and academics are working on developing practice-based research projects in cooperation with industries to promote the development of new sustainable products and services” (p. 190). Design-led innovation interventions follow the nine-step DLI framework
and are implemented through embedded, practice-led research projects (Bucolo, Wrigley and Matthews, 2012).

DLI takes design thinking and the method of design for business models and processes, requiring an open and questioning mindset from the organisation which can be promoted, facilitated and sustained by the intervention of a design innovation catalyst (Bucolo, Wrigley & Matthews, 2012; Wrigley, 2016; Matthews & Wrigley, 2011). Wrigley and Buculo (2011) define DLI as “a set of methods which allow the designer to consider and evaluate their design development from multiple perspectives, typically spanning user needs, business requirements and technology demands” (p. 232). DLI is used as a framework to build capability within organisations and add strategic value, as well as increase individuals design capability when solving problems and approaching tasks through integrating deep customer insights into business models to lead to organisational transformation. The stages of DLI, which are used as the foundation of the design interventions in the case study are outlined in Table 1 (adapted from Thurgood, Dorst, Bucolo, van der Bijl-Brouwer & Vermaas, 2015).

Table 1  Design-led Innovation Intervention Stages (adapted from Thurgood, Dorst, Bucolo, van der Bijl-Brouwer & Vermaas, 2015)

<table>
<thead>
<tr>
<th>Stage</th>
<th>Aims</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Understanding</strong></td>
<td>An assessment of the current business and its ways of innovating</td>
<td>Understanding should identify: - If strategy is aligned to their customer and business model - Any discrepancies across staff about customers, value propositions, and/or business models</td>
</tr>
<tr>
<td><strong>Envisage</strong></td>
<td>An exploration of new possibilities beyond the current business</td>
<td>Envisaging should identify new customers and markets</td>
</tr>
<tr>
<td><strong>Empathise</strong></td>
<td>An understanding of the possible problems and emotions of a future customer</td>
<td>Empathise should: - Describe journey before, during, and after proposed/current product or service - Identify customer pain and gain points - Reframe problems</td>
</tr>
<tr>
<td><strong>Proposition</strong></td>
<td>A new value proposition based on the assumed needs of a future customer</td>
<td>Proposition should: - Redefine problems at an emotional level - Design out pain points and/or leverage gain points - Narrate problems and solutions from a customer perspective</td>
</tr>
</tbody>
</table>
**Pro-vocation**
A description of the real meanings behind problems for customers

Pro-vocation should:
- Test if assumptions in narratives are true
- Reveal meanings and values outside of the problem context
- Reframe problems with more focus

**Re-design**
A new ideal but realistic value proposition and business model that the company will consider

Re-design should create:
- Customer-centric and ideal future-state value propositions
- Risk-mitigated solutions

**Connection**
A new strategy to get towards the desired state

Connection should produce business models that identify activities to be stopped, and new activities to be acquired

**Alignment**
An implementation of actual change

Alignment should implement competitive business models

**Empowerment**
An assessment of organisational change and capability building

Empowerment should show capability of staff to continually reframe

**Design Innovation Catalysts**
The purpose of design interventions in this case study was to establish and educate a cohort of industry-based professionals to the role of design innovation catalyst within their organisation. Wrigley (2016) describes the role of the ‘design innovation catalyst’ (DIC) is to “translate and facilitate design observation, insight, meaning, and strategy for all facets of the organisation” (p. 151). The value of the DIC to an organisation is crucial and a major component of the DIC is the regular interaction with learning-teaching and industry-academia (Figure 1).
Wrigley (2016) defines the four stages of the DIC Framework, which informed each design intervention in the case study and are explained below (p. 52). Absorb (bottom left quadrant) refers to the DIC discovering knowledge and theory, critiquing and questioning existing research, case studies and business models within a learning environment. DICs investigate (top left quadrant) their current organisation and gather insights and information for their current project within the organisation. DICs challenge (top right quadrant) current ways of working within the organisation, generate discussion, debate and tensions to challenge and explore new possibilities. The results (bottom right quadrant) occur when the findings of the project are disseminated and contribute to the academic research field.

Howard (2012) states that design thinking as a capability is best acquired through practice, application and experience. The skills, capability and mindset required of the DIC are crucial to their success within the organisation. Dorst (2015) defines this as seven general levels of design expertise and ways of design thinking, moving from the first, Naïve to the seventh, Visionary (p. 57). Dorst goes on to define the second level, Novice as convention based, exploring what design is and getting to know it “as a series of activities that are organised in a formal process” (Dorst, 2015, p. 57). Wrigley (2016) suggests the DIC must embody six capabilities: design knowledge and skills, business knowledge and understanding, cognitive abilities, customer and stakeholder centricity, personal qualities and research knowledge and skills. The DIC is still an emerging field and determining how the novice catalyst should be engaged, trained and upskilled through different design interventions is what this case study sought to uncover and build upon.

**Case study: Sector Traineeship Program**

The organisation we partnered with for this case study is a not-for-profit organisation owned by its members, all independent companies in the sector. This partner organisation runs many programs to stimulate growth in the overall sector, which in turn will benefit its
members. Growth opportunities are explored in many manners, for example increasing public awareness to the industry’s products, funding research and development that will impact the industry as a whole, exploring existing and new markets to develop deep customer insights.

One of these programs to support the sector is a traineeship initiative in which participants are placed in industry value chains either via full-time placements or on a temporary basis. The traineeship aims to upskill the participants in a number of disciplines that can enable them to stimulate growth within their host company. Participating companies and individuals were subject to a thorough selection process: the participants were asked to have high degrees of qualification (ideally Masters or above) and went through interviews with the partner organisation to assess their motivation and suitability to deliver the expected outcomes over time (Table 2). The traineeship program, which began in June 2016 and is scheduled to end in June 2018, required participants to dedicate 20% of their working time to the traineeship, under the guidance of a mentor within the company (usually their direct manager). They also were required to participate in regular weeklong ‘residential’ spread out during the two-year program, as these gatherings were the vehicle used to introduce participants to new learnings and debrief on the previous phase of work (see Figure 2 for an example of three residential and their content).

Table 2  List and profile of program participants

<table>
<thead>
<tr>
<th>Participant</th>
<th>Participant’s role in the organisation</th>
<th>Participant’s highest degree</th>
<th>Participant’s tenure in the organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Innovation officer</td>
<td>Bachelor – Science degree</td>
<td>New starter</td>
</tr>
<tr>
<td>B</td>
<td>Factory innovation officer</td>
<td>Bachelor – Science degree</td>
<td>New starter</td>
</tr>
<tr>
<td>C</td>
<td>Innovation coordinator</td>
<td>Bachelor – Business degree</td>
<td>New starter</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>Master – Business degree</td>
<td>New starter</td>
</tr>
<tr>
<td>E</td>
<td>Innovation officer</td>
<td>Master – Business degree</td>
<td>New starter</td>
</tr>
<tr>
<td>F</td>
<td>Project coordinator</td>
<td>Master – Business degree</td>
<td>5 years</td>
</tr>
<tr>
<td>G</td>
<td>Innovation partnerships project manager</td>
<td>PhD – Science degree</td>
<td>New starter</td>
</tr>
<tr>
<td>H</td>
<td></td>
<td>PhD – Science degree</td>
<td>New starter</td>
</tr>
<tr>
<td>I</td>
<td>Business analyst</td>
<td>Master – Business degree</td>
<td>1 year</td>
</tr>
<tr>
<td>J</td>
<td>Chief financial officer</td>
<td>Master – Business degree</td>
<td>1 year</td>
</tr>
<tr>
<td>K</td>
<td>Management information and supply chain coordinator</td>
<td>Bachelor – Business degree</td>
<td>2 years</td>
</tr>
</tbody>
</table>
This paper focuses on the first six-month of the traineeship program, which developed the participants’ ability to understand, apply and adapt design-led innovation to stimulate growth in their respective business. Following a previous collaboration applying design-led innovation (DLI) to its programs, the partner organisation understood DLI to be a critical skill for emerging leaders to equip themselves in the pursuit of business growth. The design interventions that were delivered over these six months were developed collaboratively with the partner organisation to adapt to the participants’ and businesses’ constraints. Table 3 below presents an overview of these interventions.

<table>
<thead>
<tr>
<th>Time</th>
<th>Intervention</th>
<th>Aims</th>
<th>Method of Delivery</th>
<th>Tools used</th>
<th>DIC Framework Stages</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 2016</td>
<td>Introductory workbook</td>
<td>Introduce DICs to the program and the opportunity of DLI. Give them tools to practice and a survey to reflect</td>
<td>PDF booklet sent to DICs by the partner organisation</td>
<td>Persona, value chain analysis, value proposition canvas, business model canvas, future customer exploration, five whys</td>
<td>Absorb, investigate</td>
</tr>
<tr>
<td>Date Range</td>
<td>Event Description</td>
<td>Details</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>July 2016</td>
<td>DLI Sprint case study workshop</td>
<td>Give DICs a hands-on experience of DLI process and tools to enable them to reflect on how they would apply DLI in their organisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3-day workshop, part of a week-long residential following 2 days of introduction to a variety of talks on the latest thinking in the industry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Persona, value chain analysis, value proposition canvas, business model canvas, future customer exploration, journey map, SPICE model, narrative development, customer interview, cluster synthesis, NADI model, experiment card</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>July – November 2016</td>
<td>Project support</td>
<td>Guide DICs individually through their DLI project, adapting their activities to their progress and challenges</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>On-demand 30 to 60-minute phone calls</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Focal question, persona, journey map, experiment card</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Investigate, Challenge, Absorb</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>October - November 2016</td>
<td>Progress assessment and reflection</td>
<td>Provide in-depth support to DICs and get additional context to their project (visit site, meet mentors) to plan next steps</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>On-site half-day visit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Review of previous tools’ application</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Absorb</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The process – design interventions

The goal of the interventions was to establish and educate the participants to become Design Innovation Catalysts (DICs) within their business. Each intervention covers one or more stages of the Design Innovation Catalyst Framework presented in Figure 1.

1. Workbook

The first intervention with the trainees at the commencement of their two-year program was a workbook introducing them to the purpose of the program and their first new discipline to be explored over the following six months: design-led innovation.

This workbook was sent to all DICs enrolled in the program, some being new starters in their organisations while others had the long tenure in their role. Following their successful application to the program, this was the first official document about the program that the DICs received.

The workbook aimed to grow the DICs interest in design-led innovation, and prepare them to enter the DLI Sprint case study workshop with a better understanding of (and ability to question) the content they would be working through. The workbook was structured in four sections:

1. Explain the opportunity for the sector to grow by focusing on creating value for its customers, rather than keep focusing on production efficiency – an opportunity they can either seize or opt-out of
2. Introduce DLI’s core concepts and the process that will be used during the DLI Sprint case-study workshop
3. Introduce some DLI tools (listed below) to be used prior to the DLI Sprint case study workshop, with the double aim to help DICs gain better understanding of their organisation and give them a first-hand experience of engaging others in a design activity
4. Stimulate self-reflection through a series of questions associated with the DICs’ intended project focus and their experience using the tools provided in the previous section

The workbook provided examples and templates to complete a persona (Prahalad & Ramaswamy, 2004), a value-chain analysis investigating the entire range of activities required to bring a product or service from initial conception through to its final disposal after use (Kaplinsky, 2000), a value proposition canvas (Osterwalder, Pigneur, Bernarda, Smith & Papadakos, 2014), a business model canvas (Osterwalder & Pigneur, 2010),
future customer exploration (Wrigley, Bucolo & Straker, 2016; Wrigley & Straker, 2016) and a ‘five whys’ exploration of a problem (Serrat, 2010). DICs were asked to come to the workshop with their completed tools and reflection surveys, pushing them to learn not only through absorption of academic content but also through investigation within their business.

2. DLI Sprint Workshop

The three-day DLI Sprint workshop aimed to guide the trainees through a mock case study, by following the DLI process and applying relevant tools. After each phase of work, the DICs were asked to reflect on how they would contextualise the process and tools to their individual organisation and project. The aim of this was to help the DICs develop a personalised DLI project plan by the end of the workshop.

The DLI Sprint followed two days of introduction to the broader traineeship program, as this was effectively the kick-off of the program and the first time that DICs met. Some DICs were travelling from across the country, taking time out of their business-as-usual activities. From a Chief Financial Officer of a medium-sized organisation to a sole manager of a small company, this time out was very demanding on DICs.

The workshop followed the DLI Sprint model, an accelerated version of a full DLI program which offers a practical introduction to the principles of design (see Figure 3):

- Day 1: introduction to DLI (theory and example of successful application in the industry); understanding a situation (using a persona, a value-chain analysis, a value proposition canvas, a business model canvas, a journey map [Liedtka, 2011] and a SPICE model); envisaging an ideal future (through future customer exploration and future journey maps)
- Day 2: reflection and discussion about their DLI project (handing out a proposed project timeline for them to rework throughout the workshop); exploring the future (narrative development [Beckman & Barry, 2009] to test assumptions and provocations through customer interviews)
- Day 3: exploring the future (cluster synthesis of interview outcomes, then Needs and Aspirations for Design and Innovation (NADI) analysis [van der Bijl-Brouwer & Dorst, 2014] on the clusters), creating headways to that future (using experiment cards), then recap on design theory, lessons learnt from the workshop and personal reflection on individual DLI project plans

![Figure 3  Design-led innovation sprint model](image)

The theory content was light, spread out throughout the sessions and brought to life through activities or group discussions.
The case study focused on a company’s challenge from an industry that all DICs could relate to as it was similar to theirs, yet none of them was directly engaged in it. The premise of the case study was based on DLI projects carried out with similar organisations, as well as desktop research on different innovations occurring in that sector.

Equipped with this new experience and a proposed DLI project timeline, each DIC was asked to reflect on how they would apply DLI on their own project, once back in their organisation. To this end, they had access to individualised support from the workshop facilitators at the end of the workshop, to discuss any project specifics before they returned to ‘business-as-usual’.

3. Project Support
Support was made available to DICs through the duration of their DLI project, to provide expert advice on tailoring their project to their needs.

Following the cohort-building residential, each DIC went back to their business to work on their own project, learning through investigation and teaching through challenge within their company. To mitigate the risk of isolation of these DICs within an organisation that might not support their activities, the DICs stayed connected as a group through a social collaboration platform and could call on the support of the DLI facilitators at any time throughout the project.

Support was provided through on-demand phone conversations, ranging from 30 to 60 minutes. The calls were structured to debrief on what work had been done on the DLI project, reflect on the lessons learnt and define the next steps together. This allowed the DICs to disseminate their results to academia. Based on needs identified by the DLI facilitators during the calls, other tools or techniques such as a focal question (Ertel & Solomon, 2014) would be presented for the DIC to absorb, enabling them to progress their project effectively. The demand for support calls was varied, some DICs requesting regular conversations while others were not proactive in seeking support (see Table 4).

4. Progress Assessment and reflection
A more in-depth support mechanism was made available for DICs, spending time with them face-to-face in their premises during a site visit. The aim of this intervention was to better understand their work environment, both physical and hierarchical, to provide tailored advice and support in promoting DLI in their organisation.

These visits were organised at the tail end of their DLI project due to planning constraints. This gave DICs time to progress their project further and have more detailed support needs based on their experiences to date. This also gave them more opportunity to build support from their leadership by challenging them with the approach and results of DLI. The visit was focused on meeting the trainees and ideally their mentor, and was performed by the facilitator as well as a representative of their industry subgroup.

The visits allowed enough flexibility to cater for very different DIC situations (e.g. some were able to organise a site visit or product testing) and varied audience (e.g. some could not get their mentor to attend). The discussions focused on reviewing the DIC’s work and challenges to date, discussing their next steps of personal learning and applying design within the organisation, and next steps to scale the use of design within the business.
The visits’ content evolved organically, sharing material to absorb based on needs identified in the discussion. For example, one DIC had a high-stakes meeting planned with their new General Manager, which would define the future of her DLI project. In that case, we focused on helping that DIC apply design principles to prepare for this interaction.

The demand for on-site visits was inconsistent: some DICs requested them early, others requested one only when probed, while the last group rejected the offer (see Table 4). All DICs that received a visit appeared to regain confidence in their ability to apply design principles to their project, as the discussions seemed to have broadened their understanding of how design can be adapted to their needs. For some, it was an opportunity to reflect on how DLI could be applied beyond their current project and help address bigger systemic issues in their business.

Table 4  Participant involvement in project support calls and progress assessment and reflection

<table>
<thead>
<tr>
<th>Participant</th>
<th>Number of Project support calls</th>
<th>Request for Progress Assessment and reflection</th>
<th>Number of pivots on the project</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2</td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>2</td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>C</td>
<td>3</td>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>1</td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>E</td>
<td>1</td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>F</td>
<td>2</td>
<td>No</td>
<td>1</td>
</tr>
<tr>
<td>G</td>
<td>4</td>
<td>No</td>
<td>3</td>
</tr>
<tr>
<td>H</td>
<td>1</td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>I</td>
<td>1</td>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td>J</td>
<td>2</td>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td>K</td>
<td>1</td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>L</td>
<td>1</td>
<td>Yes</td>
<td>0</td>
</tr>
<tr>
<td>M</td>
<td>1</td>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td>N</td>
<td>1</td>
<td>Yes</td>
<td>0</td>
</tr>
<tr>
<td>O</td>
<td>2</td>
<td>Yes</td>
<td>2</td>
</tr>
</tbody>
</table>

5. Debrief Workshop

This last intervention in the DLI cycle of the traineeship program was a two-day debrief workshop, aiming to assist DICs in reflecting on their experience and consolidating their new knowledge. The outcome of this cycle would then form the basis for the next cycle of learning.

The two days dedicated to this debrief were the first two of a weeklong residential (the second for the program). This was the second time the DICs met, except in some rare cases where pairs had met between residentialss. Business or personal constraints led
some of the DICs to drop out of the program (one person), get excused from the entire residential (one person) or join the residential belatedly (three people).

While the debrief was originally planned to be designed and delivered by the DLI facilitators who had accompanied the entire program, an opportunity led the partner organisation to hire IDEO to perform this activity. This change forced the original facilitators to reflect on the lessons to date in order to perform a hand-over informing the structure and content of the debrief workshop. This was an opportunity to consider the DICs’ challenges and reflect on how this last intervention could address these.

The debrief workshop was structured in three phases: first, present and discuss design at IDEO (absorb), then unpack the DICs’ design project and experience to date (results), and finally look at how to apply design to each DIC’s next phase of work. Explaining what design looks like at IDEO reinforced the messages that DICs had received to date: the principles and values were similar to what they had heard before, the process and messaging was slightly different. The presentation of each person’s work to date helped others realise that their struggles were not unique – while in some cases DICs were the ones best able to assist their peers by leveraging shared experiences. In the last phase, DICs were introduced to ‘How Might We’ framing questions, and to the IDEO Method Cards (a set of fifty-one methods described on cards, split between four categories of ‘Ask’, ‘Look’, ‘Learn’, ‘Try’). Using the tools provided, the DICs formed groups of four which had to support each other in shaping the next phase of one another’s design project: what is the brief, which three methods will be used to get started, what is the ideal outcome of this phase of work? To enhance these plans, each DIC was given a fifteen-minute time allocation for a one-on-one discussion with an IDEO designer. This enabled a higher quality of project plan through tailored advice.

The outcome of the session was positive, with each DIC reporting a clear plan and customised support, although it is unclear how this plan will evolve in the face of the next phase of learning that was being pushed upon them during the following three days of residential. The ability for DICs to fully adopt design as an underpinning project methodology remains to be demonstrated in the next phases of the traineeship program, as this paper is only a preliminary analysis focusing on the immediate impact of the design interventions.

Observations and insights
The experience of DICs has been fluctuating during this six-month period, between periods of comfort learning new skills, to doubts applying them. Figure 4 schematically represents this experience throughout the journey based on survey and anecdotal responses from DICs.
This representation highlights the ups and downs of DIC’s perceived experience. We use this to pick out the aspects of the intervention that were well received, and where improvements are proposed based on reflection.

The following aspects of the interventions generated positive reactions from DICs:

- Receiving a workbook that gives them an introduction to design
- Getting face-to-face training and guidance through a case-study example applying design
- Getting tailored advice on-site, and reassurance for their performance to date
- Shaping the next phase of their work by self-selecting methods from multiple options

The following events generated negative reactions from most DICs:

- Being asked to use design tools in their organisation before going through a formal training
- Interviewing customers, even in a mock situation as the DLI Sprint case-study: this was difficult because it led the exercise to become more ‘real’ and less an exercise in isolation of the external world
- Project development and support, when some DICs sought to follow a step-by-step approach to design and felt that they were not ‘performing’
- Debrief workshop that was reiterating many messages and left them in a passive state of consuming messages

Checking these observations against the DIC Framework (Wrigley, 2016), it appeared that the DICs were not comfortable when having to move from learning in academia back to their industry environment, struggling to apply the skills they had absorbed but not fully mastered yet. It also appeared that the DICs were at times challenged when having to absorb then apply a large amount of new content, as had occurred during and after the second intervention.

**Establishing and Educating Design Innovation Catalysts**

Seeking to address the causes of negative reactions for DICs, the authors sought to find ways to increase the comfort for them to move from academia to industry, and increase the structure and balance between learning and teaching, leveraging the DIC Framework (Wrigley, 2016). To that end, the authors suggest the following:

1. Reinforce the learning goal with DICs and mentors;
2. Manage expectations of DICs and mentors;
3. Focus on mindset rather than process and tools; and
4. Stage and tailor the learning of process and tools

For each of these suggestions, we present a rationale for the recommendation and a proposed method to apply it during a program.

Having clear goals for a series of interventions is critical: in our case, we aimed to establish and educate DICs. Making these goals explicit is equally important to enable a successful outcome of these interventions. Given the technical and industry background of the DICs, their day-to-day focus tends to be on delivery of outcomes: learning can be perceived as a classroom activity, which is then applied once back in the office. This approach transpired in the behaviour of some DICs and was strongly guided by the views of their mentor. Mentors using the program for the DIC to deliver on a pre-existing project with an established deadline skews the outcome focus from learning to delivery. Not addressing this misalignment of goals for the program puts the learning at risk: DICs feel overstretched (applying skills they have not consolidated) and under pressure (expected to deliver successful outcomes using these skills), which in turn leads to stress, anxiety and more struggle to reflect and learn. Reinforcing the learning goal, and that the learning occurs both inside and outside of classroom environments will give DICs more time and space to assimilate the skillset of design, through practice (Howard, 2012).

One way to reinforce the learning goal is to work before the start of the program with mentors and DICs to ensure they clearly understand what is required to learn design effectively. The recruitment and orientation to a DIC education program is a great opportunity to create alignment, and signals of misalignment should be addressed. Mentors could be given examples of projects adapted (and not adapted) to the learning needs of the DIC. It should also be explicitly stated to mentors that they should consider the program’s impact on their resource planning, given the efficiency of the DIC will be reduced during the program.

Going further than reinforcing the learning focus on the program, both DIC and mentor's expectations should be managed at the start of the program. Experience shows that difficult periods are probably for the DIC (practising a new skill that is not mastered), and for the mentor (apparent drop in productivity of DIC while they develop their new skill). Being upfront about these challenges to come can limit the discouragement and frustration that people could experience during such periods. In particular, if DICs expect the formal training to translate directly into applicable skills, they will self-evaluate themselves negatively when investigating and challenging their organisation. For those with a fixed mindset (Dweck, 2009), such perceptions of failure can limit their involvement in future steps. To manage expectation, using a diagram such as an experience map (Figure 4) during orientation to the program can quickly highlight the probable peaks and troughs of DIC and mentor experience over time. This can be an effective vehicle to prompt discussion around the expectations of the program, and how participants expect to deal with challenges throughout this period.

The introduction to design should then strongly focus on the mindset of a designer, steering away from process and tools (Calgren, 2013). Blending both mindset and process does not give sufficient emphasis on the importance of design’s adaptive approach to
problem-solving. Audiences with a technical background have proven to focus on process and tools, perceiving design as a technical procedure without recognising its non-linear nature (Brunswicker, Wrigley & Bucolo 2013). This focus could be achieved by front-loading the program with a focus on the concepts that underpin design (e.g. empathy, experimentation), mixing theory and case studies. DICs should also be encouraged to reflect on personal examples where a design mindset could have benefited a project they were part of. DICs could also be given exercises to investigate and challenge their organisation’s perception of design’s underlying concepts, which would help identify potential difficulties in the adoption of design within the business. This work on unpacking and developing the mindset of design should be done prior to sharing any process or tools.

Design process and tools should be the last element presented to DICs, and yet only in a staged and tailored manner. Once the DIC understands the focus of the program on learning, is conscious of the difficulties ahead and appreciates the mindset of design, they are more able to learn how to use design as a process and set of tools in an adaptive manner. Providing an overview of how a design process evolves is necessary to give participants reassurance that there is a degree of structure in design, but care must be taken to stay away from giving a prescriptive approach to applying the design. Staging and tailoring the reveal of these process and tools enables the facilitators to adapt the material to the particular needs of the DIC, without limiting the absorption of knowledge to a pre-defined set of steps and tools.

This can be done by familiarising DICs with the main steps of a design process, the objective of each step, criteria to move forward and types of tools that can be used. Based on this, facilitators should work with DICs to develop a personal project plan where only the first step of the plan will be mapped and tools selected. Once this plan enacted, DICs can check back with the facilitator to debrief on the work done and define their next steps. This would enable just-in-time learning for DICs, and a tailored approach to design which benefits from the experience of facilitators. This would suggest future work to further explore these findings in order to improve the learning experience and hence the outcomes of the design innovation catalysts.

Summary
Shaping design innovation catalysts with a limited amount of interactions is a challenge, which pushes facilitators to reconsider what is the core knowledge that needs to be passed on: the design mindset, its approach to problems or its process and tools? While this case study is only a preliminary analysis of the full traineeship program, the observations and insights presented in this paper demonstrate the difficulty for design innovation catalysts to adopt design through a limited amount of interventions from academia. Beyond the application of design process and tools, the challenge for them is to adopt a design mindset that is different to what they have learned and used so far, and to what they are surrounded with.

The proposed improvements made by the authors aim to reduce this strain by focusing further on the selection and orientation of the design innovation catalysts. Greater care should be given to ensure all stakeholders have a clear, consistent understanding of the purpose and expectations of each intervention and the overall curriculum before...
enrolling. Additionally, concentrating the program on explaining design as a mindset and approach to problems while staging the introduction of process and tools can limit the risks that DICs interpret design as a technical process to follow. Finally, this case study highlighted that further work needs to be done to better understand the most effective way to shape a cohort of industry-based design innovation catalysts who can successfully stimulate growth in their organisation by leveraging design, through a limited amount of interventions and face-to-face time.

References


About the Authors

**Raphael Hammel** is a Practitioner in the Design Innovation research centre at the University of Technology Sydney. Leveraging his engineering and management consulting background, he focuses on using design to enable people and organisations undertake more meaningful and impactful work.

**Genevieve Mosely** is a Research Officer in the Design Innovation research centre at the University of Technology Sydney. Holding an undergraduate degree in Design and a Masters in teaching and education, her research interests focus on design education and curriculum.
Evolving pedagogy: is studio a state of mind?

McWHINNIE Louise\textsuperscript{a*} and PETERSON J Fiona\textsuperscript{b}

\textsuperscript{a} University of Technology Sydney, Australia
\textsuperscript{b} RMIT University, Australia
* Corresponding author: Louise.McWhinnie@uts.edu.au
doi: 10.21606/dma.2017.86

‘Studio’ has traditionally been a place and space of creative exploration at the heart of the Design education experience. However, transitions in conceptions of studio are challenging educators and industry practitioners. Studio may now be seen as a facilitation space, not only physical or virtual, but even metaphorical. This paper explores the influence of place and space on learning and working in studio. As context, we discuss characteristics of the studio model and informal learning, including blended learning and use of flexible spaces. We then discuss industry perspectives and three studio samples in education. Through synthesising contemporary learning approaches and industry thinking, we suggest that new conceptions of studio place and space can be effective in supporting students, in Design and other disciplines, as they prepare for evolving industry practice. More can be done to reflect industry trends such as cross-studio collaboration; and integrating research and practice remains critically important.

keywords: design education; studio learning and teaching; industry studio; informal learning

Introduction

The aim of this paper is to explore the influence of place and space on learning and working in studio environments, given that different interpretations of studio have been emerging in education and industry contexts.

The Joint Information Systems Committee in the United Kingdom suggested a decade ago that “[s]paces are themselves agents for change” (JISC, 2006, p. 30). Evaluation of learning spaces is an immature field in higher education broadly, with little evidence of long-term changes in teaching practice and learning outcomes directly associated with space (Fraser,
2014; Lee & Tan, 2011). For example, Brooks (2012) undertook a limited small-scale study of the impact of two formal learning spaces (a traditional classroom and a technology-enhanced one) and identified links between the space and learning activities, including the ways in which teachers and students behave.

In the Creative Arts, in 2009 the Australian government-funded Studio Teaching Project (http://online.cofa.unsw.edu.au/studioteaching/) identified four essential elements of studio in the broad disciplines of Art, Architecture and Design: a creative community culture; a mode of teaching and learning that involves critical reflection, small classes and some teacher contact; projects simulating or integrating with professional practice; and a physical space or constructed environment, with support available for project work such as tools, equipment and technical assistance.

Since then, developments in industry studios have been explored in terms of place and space (e.g., Peterson, McWhinnie, Lawrence & Arnold, 2012). Findings based on interviews in 10 industry studios included an increasing shift to cross-studio collaboration and using combinations of formal and informal studio spaces, including social spaces such as cafes and online.

It is now timely to reflect further upon ways in which place and space can enhance creative outcomes, given the current debate surrounding innovation and entrepreneurship across disciplines and the future design of educational opportunities within universities. Physical and virtual places and spaces warrant fresh consideration, in relation to supporting student learning and preparation for industry studio practice, as we ask the question: Is studio simply a Design state of mind?

This paper is arranged as follows. First, we discuss contemporary pedagogy to support students as they prepare for industry studio practice. The pedagogical context includes the studio model of learning and teaching, together with learning environments for formal and informal learning using flexible spaces. Second, recommendations in Peterson et al. (2012) connect industry studio developments with studio in education. These recommendations relate to collaborative practice; projects; and reconceptualising space and place for creative practice/research. Third, we discuss examples of studio developments in education. We explore ways in which studio has been evolving in line with current industry innovation practices, and what this might mean for studio educators.

The paper is intended as a provocation for further discussion and action research in the community of scholars, in relation to new conceptions of studio place and space in supporting students – not only in Design, but also other disciplines – as they prepare for their future professional practice.

**Studio model**

In Design education and the Creative Arts discipline group more broadly, ‘studio’ is the ‘signature’ pedagogy, given that it is distinctive in the profession and pervasive in the curriculum of the discipline across institutions (see Shulman, 2005). Creative Arts students build and apply their knowledge and skills in an integrated scholarship model (see Boyer, 1990), with a focus on learning through practice, research and discovery.
The significance of developing creative practice within the studio model of learning and teaching has been highlighted by many on opposite sides of the world, in terms of the student learning and assessment journey towards professional practice (e.g., de la Harpe et al., 2009; Orr, Yorke & Blair, 2014).

As an educational concept, studio involves individual and/or collaborative project-based learning; but it goes further. At the heart of this learning experience is the creative milieu of studio – with its embedded research, exploration, creative thinking, critical reflection, and observation of others’ practice, in a creative community environment that encourages risk-taking and experimentation (Zehner et al., 2009). It is this ‘creative milieu’ that the space facilitates, that generates the state of mind that is the ‘becoming’ and ‘being’ a designer.

As a pedagogical model, studio represents a continuum for participants from education to industry practice. Since ‘work ready’ graduate attributes may be seen as a point of difference for professionally and vocationally oriented higher education institutions, it is important to reflect upon the influence of research and theoretical frameworks on creative outcomes, in both education and industry studio. It is also important to reflect upon ways in which communication, collaborative problem-solving, technology skills, initiative, and self-management can be strengthened in studio (see also Orr, Yorke & Blair, 2014).

Employers have continued to lament the lack of interpersonal and communication skills in graduates across disciplines (e.g., Norton & Cakitaki, 2016). Employers have also expressed concern that, despite university claims about graduate attributes being embedded in programmes, “it is not clear how well integrated these [attributes] are into coursework and other aspects of university life” (Norton, 2013, p. 77). In addressing any possible shortfall, de la Harpe, McPherson and Mason (2012, p. 110) suggest a formal learning approach in the Creative Arts:

*Using formalised peer learning purposefully in studio is a way to strengthen the development of graduate attributes that industry has been calling for, for over the last two decades. Being able to communicate, work in teams, solve problems, use technology, as well as show initiative, be enterprising and manage self are most often recognised as critical to successful employment. Such attributes extend beyond disciplinary content, positioning graduates to engage in work futures that are increasingly globalised, diverse and complex.*

There has also been a shift in the educational use of the term ‘studio’ particularly related to the physical space involved. Although the industry studio is still very likely to incorporate dedicated individual spaces for practitioners, as well as spaces for collaboration, gone are the days when most Creative Arts students across institutions could expect a dedicated physical studio space to be available constantly for their sole use.

At this point we can ask ourselves: *Is this actually a problem for our students, or do we as academics need to ‘let go’ of the past?* In response to this question, we can go further and reflect upon whether ‘studio’ might be metaphorical rather than an actual place – in fact a state of mind – and whether studio might be reconsidered in this light.
With this in mind, we now consider the role of informal learning, including flexible spaces and blended learning (combining face-to-face and online learning) relevant to the collaborative studio experience.

**Learning environments**

Informal learning involves interaction between students in informal settings, which may be physical spaces on or off campus, or using technology (e.g. Goodwin, Kennedy & Vetere, 2009). Social interaction with peers has a range of academic benefits for students, and collaboration can be supported in open-plan informal learning areas through making creative use of spaces that have not been considered before as learning environments (JISC, 2006).

An example of successfully involving students in the redesign and refurbishment of an under-utilised open space is the Belonging Project in the School of Media & Communication at RMIT University in Melbourne, Australia. Use of a large and previously empty atelier space increased significantly since Interior Design and Communication Design students and academics co-designed its transformation, with the outcome that the newly designed space contributed to a real sense of community and ownership (Morieson, Carlin, Clarke, Lukas & Wilson, 2013).

Another example involving students in the co-design and co-creation process is the University of Adelaide’s Hub Central initiative (https://www.adelaide.edu.au/hub-central/in-the-hub/), which again has resulted in more ownership by students with increased use of social space:

> The key elements to the student experience within Hub Central have been identified as an informal learning space which facilitates aspects of social learning; a library which is integrated in the learning process; services for students which are delivered face-to-face and on-line; and information technology facilities which encourage informal and flexible learning practices, with ongoing student-focused support.

Student perspectives are also crucial in the design of spaces for blended learning (combining face-to-face and online learning), so that active and peer learning is supported and technology preferences are taken into account for connecting with others (e.g. Benson-Armer, Gast & van Dam, 2016; Jürgens, 2012; Riddle & Souter, 2012; Selwyn et al., 2016; van Dijck & Poell, 2013). In designing learning environments with social media to encourage a sense of community, it is important to balance accessibility and usability of technology with a sense of belonging (Jürgens, 2012).

‘Community’ should underpin the design of physical, virtual, formal and informal flexible learning spaces – to be inclusive, support collaboration, encourage deep learning for critical engagement, and motivate learners (e.g. Bickford & Wright, 2006; JISC, 2006; Lisbôa & Coutinho, 2011).

In the Creative Arts, ‘community’ underpins practice-based learning in face-to-face and virtual studio environments, with a focus on interdisciplinary teamwork and the processes involved in solving design problems (see Peterson, 2016; Saghafi, Franz & Crowther, 2012). The achievement of creative outcomes for students may also be enhanced through both
formal and informal learning environments – although the jury might still be out, in terms of whether there is sufficient evidence of such enhanced learning and achievement of outcomes because of particular space configurations (Lee & Tan, 2011).

We now turn to industry practice, as we reflect further upon whether studio might be metaphorical rather than an actual place.

Preparing for industry studio

In the Creative Arts, educators can support students to have a positive learning experience through high-quality programs with interesting and challenging real-world studio projects, which are rigorous and relevant to industry problems, inspiring and innovative, often involving different disciplines, and underpinned by contemporary pedagogy (Zehner et al., 2010).

In higher education, it is important to know what industry needs are and to develop a mutually beneficial ‘shared agenda’; this requires relationship management, trust and mutual understanding, which takes time and effort (Universities UK, 2014). In seeking to understand industry needs and to inform thinking about studio in education, a study was undertaken including 10 sample interviews with Creative Arts industry studio practitioners (see Peterson et al., 2012). The interviews explored dimensions and characteristics of current and predicted industry studios.

The interviews were conducted with studios in three Australian cities and spanned different Creative Arts specialist areas as follows:

1. Graphic Design
2. Industrial/Product Design
3. Motion Graphics, Animation, Film Production
4. Video/Media Installation
5. Dance
6. Creative Writing
7. Music
8. Architectural Design
9. Interdisciplinary Studio: Interior Design and Graphic Design

Given that the sample was limited to 10, the industry studios were chosen to maximise diversity in terms of location and discipline mix, but also size of studio practice, scale of client base, type of studio practice, activity, and creative outcomes.

The interview questions focused on what industry studio is and may become, together with the implications for educational studio. Based on the interview analysis, priorities were recommended for educational studio to reflect current and emerging trends in industry studio practice, and to help lead industry practice, summed up as follows (see Peterson et al., 2012):

Collaborative practice
- Creative teams, including inter- and cross-disciplinary practice
• Cross-studio practice for maximising resources and increasing competitive advantage
• Integration of research and practice

**Intensive and longer-term projects**
• Community and industry engagement, with real-world deadlines
• Client interaction in the studio, with clients participating in the creative process
• Non-linear projects, with research-driven creative outcomes

**Re-conceptualisation of space and place for creative practice/research**
• Adaptable, evolving learning space
• Combination of face-to-face/virtual events and social networking for community
• Creativity/research nexus for ‘creative knowledge makers’

With this in mind, three examples of studio in education are described next. They illustrate many of these recommended priorities, with suggestions for aspects needing further strengthening.

**Studio practice examples in education**

*Designing Out Crime Research Centre (‘DOC’)*
The University of Technology Sydney and the New South Wales Attorney General’s Department have invested over $1 million annually to help reduce crime through smart, secure design. The Designing Out Crime (DOC) Research Centre at the University of Technology Sydney researches simple and well-targeted design interventions aimed to discourage opportunistic crime.

For several years, DOC has offered an Interdisciplinary Design Studies elective (a ‘Winter School’ module/unit/subject) for undergraduate students. Participating students are drawn from various disciplines, including Design, Architecture, Built Environment, Law and Business. The students are assigned into teams with a specific research brief, which requires exploration of design interventions against crime. In the three years in which the elective has been offered, approximately 500 students have delivered 70 projects to the partner organisations. The areas of opportunistic crime investigated include, for example, alcohol-related crimes; beach theft; illegal dumping; public transport crimes; retail theft; and university campus safety.

In such an educational studio, the scenario is as follows. A typical DOC Studio is delivered within a 5-week intensive elective module/unit/subject. The purpose of the Studio is the creation of innovative solutions to actual client briefings of specific crime-related issues, with topics, or crime problems, drawn from DOC’s industry partner base.

Students form interdisciplinary teams, with each team being assigned a specific problem or issue. Students thus not only experience their own group negotiation of the problem and solution, but also observe the development of alternative solutions to a range of problems. With each team led by a design tutor, students explore the particular crime problems and identify suitable design approaches to reducing opportunities for crime. The
The design experience is not always physically within the studio space and includes students making site visits and undertaking research.

Research underpins and informs the solutions developed, drawing on the resources of the DOC Research Centre and data from the Bureau of Crime Statistics and Research. The crux of the DOC approach lies in creatively re-framing the questions that the partner organisations pose to the Centre. This re-framing requires a study and in-depth analysis of the broader situation beyond the original brief, which more often than not requires original research.

The Studio supports all the students in learning to navigate the client relationship through group work, negotiation and transparency of process. Industry clients are involved throughout the creative process, within a real-world environment. The Studio concludes with the pitching of design concepts to the industry partners, who provide feedback to the teams and, in some cases, adopt the research-driven and cross-disciplinary design solutions.

Members of the Design Against Crime Research Centre from Central Saint Martins College of Art and Design (University of the Arts London) have visited and contributed to the delivery of DOC Studios. Projects have also run in parallel between similar research units (Sydney, Delft and London). Whilst these have shared outcomes, until now they have not resulted in real-time collaborative cross-institutional Studios, expanding beyond the confines of the students' own institutions.

In summary, this studio experience supports collaboration across design disciplines and introduces non-designers into the project teams. It enables non-designers to experience and contribute to the particularity of problem solving and design thinking within a creative studio setting, whilst design students are also able to experience the contribution that non-designers can make to client interaction and the creative process.

This intensive studio example goes some way towards incorporating flexibility of learning spaces and approaches. However, learning could be enhanced through the greater integration of social media to facilitate communication, collaboration and a sense of community. This would be in line with discussion of learning environments earlier in this paper, as well as findings of the industry studio practice project (Peterson et al., 2012).

In addition, whilst cross-institutional collaboration of students has not occurred to date in the DOC Studio, it may well do so in the future. Cross-studio collaboration would again be in line with the findings of the industry studio practice project interviews discussed earlier, which highlighted such collaboration as an emerging trend in some Creative Arts industry studios including Design.

The Bachelor of Creative Intelligence and Innovation (‘BCII’)
The Designing Out Crime (DOC) Research Centre at the University of Technology Sydney developed a particular form of studio model to support collaboration across Design disciplines, whilst also integrating non-designer contribution. The same institution then developed a new truly transdisciplinary model and programme. In 2014, the Bachelor of Creative Intelligence and Innovation (BCII) was launched: a transdisciplinary double degree combined with 18 core disciplines and degrees (increased to 25 by 2017).
Within the BCII and through a project-centred, studio/lab educational model, teams of academic staff and students combine with industry, researchers and community partners to address issues and achieve real-world outcomes. Utilising a studio model, multidisciplinary teams undertake transdisciplinary learning activities and projects.

The studio/lab acts as a site to deepen the collaboration between the teaching academics, students, industry and public sector stakeholders. The latter provide the real-life, complex context in which the students can learn to tackle open and ‘messy’ problems. Such problems cannot be addressed by a singular discipline or sole stakeholder perspective.

Students experience a very different way of learning, compared to their core disciplinary degree within this double degree programme. Collaborative learning occurs in a range of formal and informal learning spaces, on and off campus. The University explains that students engage in ‘speculative proposals, what-if scenarios, thought experiments, and acting on their own ideas and inspirations’ (www.uts.edu.au).

Whilst some participants are familiar with a lab environment, many are from disciplines traditionally unused to a studio model. The studio environment co-designed and co-created in the BCII acts as a catalyst for transdisciplinary engagement as well as open space assessment and critique.

It is the open studio that provides the site of engagement, particularly for students and indeed industry stakeholders. This open studio closely reflects the growing trends in workspace engagement for innovation in industry, and the start-up culture of collaborative hot-desking and communal work space. It is therefore the studio – both as a site of collaboration as well as a state of mind – that facilitates collaboration, transdisciplinary participation and engagement, involving multiple disciplines and partners.

The DOC and BCII sample studios in education reveal that more work is needed in terms of cross-studio collaboration and online creative innovation studios. But progress is being made with different interpretations of place and space to reflect industry trends, especially to encourage transdisciplinary innovation. Research needs to remain integral to the studio in education to help lead emerging industry practice.

**Introduction of studio across disciplines (‘MC2015’)**

In 2015 at RMIT University, a large school (6,500 students) has introduced the studio model across 12 bachelor degrees and 8 postgraduate programmes spanning Creative Arts, Humanities, Social Sciences and Business specialisations.

In a major initiative of structural and pedagogical transformation (‘MC2015’), each programme now combines one larger credit point subject (module/unit) for ‘studio’ every semester (half a full-time study load) with two smaller subjects for knowledge and skills development. Electives are included in the programmes from different parts of the school, designed deliberately to enable interdisciplinary experiences for students. Some core subjects also include interdisciplinary collaborative projects across the school.

Some programmes offer multiple thematic or issues-based Studios (such as Climate Change), with industry/community stakeholders for input and critique, and possibly
involving students from multiple year levels and different disciplines. Some Studios are intensive and others are developed over a 12-week semester.

Other programmes do not offer thematic Studios to diverse participants, but do incorporate at least some of the elements identified as ‘essential’ in the Australian Studio Teaching Project (http://online.cofa.unsw.edu.au/studioteaching/): a creative community culture in a space or constructed environment with support available; and professional practice projects including industry/community involvement, research and critical reflection.

Given that there are different disciplinary traditions in teaching and professional practice across the 14 specialisations in the school, it is not surprising that there are different interpretations of ‘studio’ if we compare approaches in areas such as journalism and games design, or public relations and animation. However, resonating with ideas highlighted earlier (e.g., Saghaﬁ, Franz & Crowther, 2012), project- and practice-based learning has been extended, with a stronger focus on research, interdisciplinary teamwork and the processes involved in solving problems. This has been mostly in face-to-face but also some virtual studio environments.

Common features of the studio model introduced now include – albeit in different ways – embedding research; creative thinking; exploration and experimentation; observation of others’ practice; and critical reflection on and in practice (Zehner et al., 2009).

There is a growing number of cross-discipline Studios, with students collaborating to address social responsibility issues and research with community/industry partners. For example, Design and Media students came together with a community service not-for-profit to solve communication and service design problems. In other Studios, the focus has been on partnered research projects and fieldwork. For example, Communication students and academics worked with an international network for social change.

Student voices convey their responses to the ‘new’ studio pedagogical approach adopted across programmes since 2015. De-identiﬁed qualitative comments drawn from internal surveys in the studio subjects were grouped thematically, in response to the survey question: What did you like best about this subject? As an illustration, these included:

**Time for depth, learning and personal growth:**
“Creation of atmosphere, development of knowledge, freedom for exploration and depth of shared and interactive involvement (between students as well as students and staff)”

**Motivation:**
“Enjoyment of learning opportunities, engagement in a depth of work and conceptual exploration of ideas, collaboration through group work, strategic thinking and the integration of industry feedback during the process”

**Challenge**
“Intensity of the educational experience, continuous challenges, intellectual stimulation and reflection and incorporation of theory into practical outcomes”

**Preparing for professional practice**
“Develops and builds conﬁdence in career choices as well as insight into professional practice”
Summing up, MC2015 shows how a creative practice pedagogical approach has been embedded *within* programmes in different disciplines, whereas the BCII described earlier shows how a double degree approach has been developed to connect creative studio practice with other disciplines and programmes.

Ideas of space and place have shifted in MC2015 such as urban and international fieldwork with partners, illustrated in the Design/Media and Communication Studios. Although the MC2015 Studios may not go as far as transdisciplinary innovation achieved in the BCII double degree approach, adopting the studio model *within* non-traditional disciplines has certainly been encouraging.

The DOC, BCII and MC2015 examples showed that some progress is being made in terms of cross-studio collaboration or online and international studios, but this requires further work. Research clearly needs to remain integral to studio in education.

Building upon these examples of studio practice in education, we now look to the future of studio pedagogy, in line with contemporary and emerging industry practice whilst making the most of informal and flexible learning spaces.

**Emerging studio**

A creative community environment was highlighted by the Studio Teaching Project (http://online.cofa.unsw.edu.au/studioteaching/) as being central to studio learning experiences, which should incorporate risk taking and experimentation; research and critical reflection; and support and feedback for projects.

With these features in mind, there may be different and new ways to conceive, enable and foster a creative community environment, in the context of contemporary formal and informal learning perspectives and emerging industry practice.

Peer learning and the co-construction of knowledge are emphasised in the social constructivist approach (e.g., Woolfolk, 2013). The three examples from education (DOC, BCII and MC2015) illustrate that connections can be made within and between disciplines for creativity in collaborative learning environments. We can add value to other areas such as business, science and technology in creative and productive ways; in turn, design can be re-contextualised and re-imagined from multiple perspectives.

Studio pedagogy can be explored further in this community context, making new and creative connections between practice in industry and education, and in disciplines not traditionally associated with this pedagogy (Peterson et al., 2012; Zehner et al., 2009). Strong connections between research and teaching can be embedded in the curriculum to help shape future-oriented disciplinary, interdisciplinary and transdisciplinary practice in industry. The BCII is a case in point; it also illustrates how practice might change when spaces change (see JISC, 2006).

Zehner et al. (2010) suggest that an open-ended and collaborative space of exploration is the real spirit of ‘studio’. Through supporting multiple modes of delivery, integrating research and teaching, and encouraging formal and informal learning in flexible places and spaces, we can uphold and extend disciplinary traditions of studio.

If we adopt the priorities recommended in Peterson et al. (2012) in line with industry practice, we will continue to strengthen: collaborative practice, especially cross-studio and
virtual studio practice; intensive and longer-term projects, with research-driven creative outcomes and clients participating in the creative process; and re-conceptualisation of space and place for creative practice/research.

We will continue to include adaptable, evolving learning spaces to support formal and informal blended learning, including face-to-face and virtual events and social networking for developing ‘community’. This will also reflect recent broader industry trends of creativity and innovation being supported, where workers are “flexible, agile, networked and connected” (Hajkowicz et al., 2016, p. 9).

There is a very real challenge for universities to balance the needs of employers and students, and flexibility should underpin collaborative practice and project opportunities (e.g., Lee & Tan, 2011; Universities UK, 2014, 2015; Wade, Trinidad & Woodward, 2012). Flexibility should also underpin reconceptualising space, in terms of facilitating opportunities for students to experience informal learning opportunities individually and collaboratively. The design of learning spaces should always be relevant to the specific context and use intended (JISC, 2006; Lee & Tan, 2011). As mentioned, the BCII is encouraging.

**Concluding remarks**

This paper has discussed contemporary pedagogy, including the studio model of learning and teaching, formal and informal learning, and flexible learning spaces, to support students as they prepare for emerging industry needs and evolving professional practice. The paper highlights ways in which place and space can be reconsidered to enhance creative outcomes. It raises the question of whether different and new ways therefore exist to conceive of creative community environments, within the context of contemporary educational and industry practice. If new conceptions of creative community environments still encourage risk taking, experimentation, research, critical reflection and observation of others’ practice (e.g., Zehner et al., 2009), we suggest that studio is ‘alive and well’.

Educational examples were provided of the University of Technology Sydney’s expansion of studio to facilitate multi- and transdisciplinary student learning; with another example of RMIT University’s adaptation of studio within programmes spanning Creative Arts, Humanities, Social Sciences and Business specialisations.

The educational studio examples are limited, and the industry studio findings discussed earlier were drawn from a sample of 10 interviews (Peterson et al., 2012). However, they serve as prompts for consideration with current industry innovation practices in open studios, reflecting the start-up culture of collaborative hot-desking and communal workspace.

It is clear that recent years have witnessed different interpretations of studio emerging in education and industry contexts. Studio now brings people together in physical or virtual spaces – people who might otherwise not integrate their learning, disciplinary perspectives and industry practice. Emergent studio models include how studio can be defined and utilised as both a site and new state of mind for students, industry and community engagement, beyond the disciplines for which studio has traditionally been regarded as a ‘signature’ pedagogy.
Certainly, studio has traditionally been perceived as a site of (often allocated) creative workspace. However, changes in industry practice, financial demands on institutional space, the emergence of more flexible educational practice, the design of more student focused educational experiences, and the design of new and more flexible environments have all influenced different conceptions of studio. There is now a strong focus upon learning spaces as a site of greater student engagement. New models of learning are also combined with new and future industry practice.

Despite institutional challenges to the space requirements of the studio as a physical site and practice, some Design educators have been fierce in their determination to maintain its traditional placement as a central pedagogy. This could be regarded as occurring for all the right disciplinary reasons, as well as a means of perpetuating historical work practices, maintaining identity, and upholding creative differentiation within the institution.

We suggest that changes to educational models and increasing responses to spatial challenges and new learning spaces within institutions should not be regarded as resulting in irreversible changes to the studio model, but in fact a natural development including its adoption by others as a place, space and practice. Shulman (2005) points out that although a signature pedagogy is core to practice in education and the profession, it is also dynamic and subject to evolution in line with external shifts.

If the physical tradition of the Design studio is changing, so too is how it is regarded and can be adopted or adapted by others – as a place, as a space and as a state of mind. It is transitioning and emerging as something exciting, innovative, creative, agile and mobile, expanding beyond the disciplines for which it was originally the educational pedagogy and industry practice. The studio is emerging as a new form of educational state of mind, with Design studios potentially becoming mainstream by being adaptable and supporting innovative creative practice within and across disciplines.

As work practices change and new forms of innovative industry practices emerge, if studio is a place, a space and a state of mind, should changes now be regarded as an embracing of the studio model, rather than as a threat? Perhaps the challenge to studio is simply the risk to the perceived mystery of creativity and differentiation that studio has always embodied – not that studio is necessarily being lost to Design, but rather that it is being adopted and built upon by others in different and creative ways.

References


About the Authors

Professor Louise McWhinnie is Dean of the Faculty of Transdisciplinary Innovation at the University of Technology Sydney. She has earned an Australian Learning and Teaching Council citation and awards and recognition for teaching and the integration of research into teaching.

Associate Professor Fiona Peterson is a Principal Fellow of the Higher Education Academy, UK. She is Chief Investigator of an Australian learning and teaching research project on employability futures; and author of a book, Creative Leadership Signposts in Higher Education.
Experience-led Design Strategy

FENN Terence* and HOBBS Jason

University of Johannesburg, South Africa
* Corresponding author: tfenn@uj.ac.za

In this discussion, we refer to a set of tools and processes that we have developed and applied in our teaching practice to assist students to develop strategic resolution of complex design problems. Initially, we provide a brief account of theory, which firstly, locates high-level design strategy within the broader methodological concern of Design Thinking, and, secondly, introduces and discusses the concept of experience-led design to the reader. Lastly, the theoretical framework presents a brief framing of the elements of impactful strategic development. The various considerations of the theory are articulated in a conceptual framework, which informs the application of two design tools and related techniques that we have developed namely, Experience-led Strategy Frameworks and Experience-led Relationship Models. The application and effectiveness of the design tools to guide students’ strategic design thinking is described in reference to examples of third-year user experience design student work.

keywords: design strategy; experience-led design; design education; visual tools

Introduction

As educators involved in teaching undergraduate student’s user-experience and service design, we have recognized two fundamental aspects of the design process that students’ struggle to conceptually negotiate. Firstly, students typically have difficulties in reconciling final design solutions with design research findings in a meaningful manner thus often negating the whole research process. This is particularly the case when students attempt to resolve complex, societal problems within a human-centered design (HCD) paradigm. Secondly, students also tend to struggle to identify the appropriate types of experience required by the future users of their designs. Selecting appropriate experience goals is, as
we discuss in detail in later sections of this paper, essential to design products people want to use.

In this paper, we describe and discuss a set of tools and processes that we have developed and applied in our teaching practice in order to assist students to develop strategical thinking that integrates the need for synthesizing research finding with final product ideation, and, the selection of appropriate experience drivers. At a theoretical level, this paper suggests that effective design strategy can be formulated by integrating strategic thinking techniques with theoretical accounts of experience, most specifically Marc Hassenzahl’s contemporary account of Leontiev’s Hierarchical structure of activity (Kaptelin & Nardi 2012: 28), a fundamental principle of Activity Theory.

This structure of this paper is as follows. Firstly, the role of design strategy in Design Thinking is briefly discussed. The fundamental concern raised is that when students are faced with complex indeterminate problem that commonly occur in HCD, that product-orientated design strategy is not on its own robust enough for problem resolution. The second section of the paper introduces and discusses the concept of experience-led design and related theories useful for identifying users’ experiential needs to the reader. Thirdly, a brief framing of the theoretical elements of impactful strategic development are presented. The various theories are then integrated into a conceptual framework for Experience-led strategy, which is applied in the design two tools namely, Experience-led Strategy Frameworks and Experience-led Relationship Models. The express purpose of these models is to assist design students structure their own strategic design thinking. Both models are illustrated, explained and exemplified in student examples.

Design is a field that due to its fluidity of disciplinary and paradigmatic approaches is hard to explicitly define. Thus before we begin, we will briefly introduce our personal context, and the subjective position and assumptions from which we write. Firstly, this paper describes an educational approach and as such is primarily concerned with introducing a fundamental understanding and set of techniques related to design strategy that students can use develop and structure their understanding and experience of design. Secondly, the learning outcomes of the teaching programs described in this paper relate to the development of innovative and creative problem solving abilities rather than to the crafting of design product. In these teaching programs, students are expected to resolve ill-defined, wicked (Riettel & Webber, 1973, Buchanan, 1992), problems that affect people and communities and purposely have no obvious mode of resolution. We believe the ability to resolve complex indeterminate problems is an essential training for design students, however, we recognize that this does not imply every design problem is complex nor that that resolving complexity is relevant for every design discipline. We do believe therefore that the positions articulated in this paper are most pertinent to fields of design concerned with experience and technology design.

Lastly, while we have very briefly introduced aspects of these design tools in earlier work (Fenn & Hobbs, 2017) with a focus on bridging the gap between design research and design ideation, in this paper we emphasize that value of integrating notions of activity theory with those of strategy in order to explore how users’ experience needs can explicitly impact the strategic considerations of what should be designed.
**Design Strategy: High-level and product-orientated strategy**

In the context of our discussion, Design is framed as a field of practice concerned with need identification and the subsequent creative creation and management of sustainable change. We use ‘design strategy’ to refer to the process of conceptualizing strategy within the continuum of design thinking processes (Nixon, 2016, p. xiii) orientated towards resolving complex, indeterminate problems. Strategy is understood as a high-level plan for identifying and articulating what course of action needs to take place in reference to a given set of conditions in order to resolve a particular problem.

While, we recognize that in design, the outcome of strategy is typically focused on the consideration of artefacts, it is our belief that design strategy can also include social, organizational and system transformation. We also recognize that strategy in design can have multiple paradigms of purpose including business and technology. In this paper, we focus on a human-centric approach to strategy that emphasizes the role of experience as a driver of motivated action. While we primarily discuss how experiential concerns can orientate strategy, we recognize that in design practice, it is often the merging of business, technological and human concerns that result in the most effective strategies and lead to design’s contemporary positioning as a tool for organizational and business development (Kolko, 2015). This paper focuses on articulating and demonstrating through pedagogical means how people’s motivational needs can inform high-level strategic intent. This endeavor is of value as people, their ideas, personalities and capabilities are in essence the medium of design strategy (Miller 2016, p. 116) particularly within a HCD framing of Design Thinking where feasibility and viability are always determined primarily by what is desirable to people (IDEO, 2009, p. 8-9).

To articulate how design strategy is applied in this paper and the impacts thereof, we will provide a brief description of design thinking. Abduction is a form of reasoning used in problem solving applies evaluative and creative modes of thinking in an integrated manner in order to help the problem solver “stay somewhere in the middle of purely intuitive thinking and purely analytical thinking (Wendt, 2014, p. 64). For these reasons abductive reasoning has been closely associated with design by numerous authors (Cross, 2001; Kolko, 2010; Owen, 2007; Wendt, 2014). Thus the term ‘Design Thinking’ is often used as a methodological description that abstracts the process of abductive reasoning into a set of phases that map the archetypical phases of the design process. ‘Design thinking’ can also have other definitions related to, for example, how the designer’s thinking occurs during ‘making’ in conjunction with their physical engagement with the world and their evaluative self-knowledge of ‘being-in’ the world (Wendt, 2014, p. 49). In this discussion, we simply refer to Design Thinking as a mapping of the design process and related activities.

The design thinking methodology is often represented visually as a process model containing a range of iterative and often overlapping phases. While numerous organization such as IDEO (Brown, 2007), Stanford (2016), and SMU1, Dallas (Lorenzo, 2016) have modelled their own variations of the design thinking methodology, design

---

1 SMU: Southern Methodist University, a leading design education Institute in Dallas Texas.
thinking can be understood to consists of five fundamental phases as articulated in Figure 1.

![Diagram](image)

*Figure 1  The modeling of the design thinking methodology applied in our teaching practice.*

The Understand Phase relates to a systemic understanding of the contexts (Dorst, 2015, p. 25) within which, design problems are located. Systemic framings of design problems are typically approached by applying explorative research methods to various factors within problem contexts in order to generate data and finally insights that reflect the contexts of the problem. In the Strategize Phase, what is desirable for people and business is addressed in reference to the constraints and opportunities of what is feasible from a technological, environmental and broader socio-cultural perspective. In a manner consistent with what Dorst refers to as problem framing (2015, p. 25), design strategy addresses the why, what and how of particular problems in order to determine the why, what and how of the problem resolution. In the Ideate Phase, alternative concepts for resolving the problem i.e. how to meet the design strategy through the consideration of systems, channels, products, people and environments are conceived. In the Prototype Phase, a range of the concepts, which are adjudged to have the most likely chance of succeeding are constructed in an embodied form. In the Evaluation Phase, the designer’s assumptions are tested. Evaluation can take place at numerous phases of the Design Thinking process including the Understand Phase to establish where problems lay, at the Ideate Phase to establish which ideas are strongest, reflectively by the designer in the Prototype Phase, and, most notably to tests design concepts with users at the end of each iterative design cycle.

In reference to the Design Thinking model presented above the remaining discussion of this section describes some of the fundamental difference that impact a consideration of design strategy when applied to resolving wicked problems in contrast to non-complex design problems.

Design education traditionally focus on the apprenticeship of the student (Muratovski 2016, p. 16) into the specific design discipline. Design disciplines such as Graphic Design, Industrial Design, Fashion Design etc. are constituted to respond to particular range of problems which in turn have an established range of ways of being solved through the product ‘categories’ of the discipline (Buchanan 1993, p. 12-13). Industrial design, students, for example, resolve problems related to Three Dimensional, physical products.

---

2 While we use ‘business’ to describe the role of the client this could equally refer to any client organization including NGO’s and governmental organizations that may focus more on value than financial profit or position.
The expectation is that during their education the design student masters the product-solution concepts that answer the type of problems associated with the relevant discipline. An example of this approach would be the requirement placed on Industrial Design students to design a chair in relationship to a particular contextual requirement such as ‘for 11-13 year olds in classroom’, using locally sourced materials’ and ‘as inexpensive as possible’. The student would only need to consider the ‘chairness’ in their design thinking. Thus the Understanding Phases of their design project would include research related to ergonomics and materials; Strategy Phase concerns would be potentially concerned with target market and cost; in Ideation numerous styles of chairs would be sketched; Prototyping would hypothetically involve ply-wood mock-ups; and; evaluation would take the form of aesthetic considerations, practicality and people sitting in the chair.

This traditional approach to design is what Tim Brown (2008, p. 86) refers to as a ‘late-stage add-on in the innovation development process’ in which the role of design is principally to provide creativity within the constraints of the products and technologies boundaries (ibid). Once again, applying broad strokes to the Design Thinking process, we view Ideation, Prototype and summative Evaluation as largely residing comfortably in this traditional framing of design education with Research and Strategy generally only concerned in relationship to the predetermined product-solution. We term these types of problems non-complex design problems not because they are easy to resolve but because the problem is pre-defined. Thus, all the complexity of the Design Thinking process takes place in problem resolution. In design education, these types of problems are presented to students, commonly in briefs that require the design of defined products. In these non-complex projects design strategy relates to product crafting and ideation.

The emergence of design thinking as an explicit model for practice (particularly when practiced in conjunction with HCD) which seeks to address complex societal problems has led to a contemporary reframing of design, which we (Hobbs & Fenn 2015) amongst many other design academics such as Rittel and Webber (1973) Buchanan (1992), Krippendorff (2007), Sander and Stappers (2008), have described.

Principally, this application of the Design Thinking methodological framework has required students to explore and frame highly complex and often indeterminate wicked problems and, thereafter generate design strategy that articulates the co-creation of value for both user-communities and business within the limitations and opportunities of the techno-socio background. It is this conceptualization of design strategy, which we will refer to as high-level design strategy that this paper is concerned with. High-level design strategy precedes product-orientated design strategy.

By way of analogy, high-level design strategy is more closely associated with formulating the design brief and the conditions for successful meeting the brief then a determination of what should be designed.

When design problems are wicked, framing them typically involves forms of design research to firstly, gain an overview of the factors that constitute the ecology of the problem and then to secondly, focus on particular aspects of the problem that are capable of, and, worthy of being resolved. Framing in this sense is a strategical subjective decision often considered in reference to the knowledge, resources and ability to be impactful.
available to the design team. In HCD these factors could include users and other role players, commissioning organizations (public or private), competitors, environmental contexts (natural or technological), as well as societal, cultural, economic, political and historical forces (Hobbs & Fenn, p. 2015). Research methods used can include quantitative, qualitative or a combination of approaches.

It is our experience that students, typically, once taught design research methods and methodologies execute in-depth, informative and competent design research. Similarly, most design students are capable of executing product-orientated design strategy in reference to a design brief. However, where students struggle most is in the conceptualization of high-level design strategy as there is often a large disconnect between their research insights emerging from their problem framing and the design concepts they present in Ideation (where they typical fixate on their own subjective and often unrelated solution concepts).

**Experience-led Design**

‘Experience’ is an ‘ever-present’ inner narrative, which result in reaction to our emotional engagement with the world (Hassenzahl 2010, p. 6). Experience can, depending on contexts and personal subjectivity, be either negative or positive (Rogers et al, 2015, p. 23), for example, our personal experience of engaging with an electronic sewing machine can be highly-frustrating and painful if we have never used one before, or smooth and therapeutically if one is an experienced, passionate clothes maker.

Experience Design, as a field of practice, focuses on curating the degree and character of the emotional engagement of people when using technology (Rogers et al, 2015, p. 23). In Experience Design, the overarching goal is to produce appropriate positive emotional responses or ‘positive experience’ (Hassenzahl, 2010, p. 3) for peoples’ engagement with technology. The underlying logic of Experience Design from a strategic point of view is that if users enjoy positive experiences with particular organizations, services or products they are more likely to want to or continue to use them.

For the sake of this discussion, we have separated Experience Design into two interrelated phases. The first of which we term Design-led Experience (DLE), which relates to the crafting of the design solution so as to ‘create’ the required emotional response in the users. Much of the focus in contemporary experience design literature (most often practitioner based) equates Experience Design with DLE (McCarthy & Wright 2004, p. 9-10). ‘Positive experience’, is often positioned as a known universal quantity, consistent and pervasive to all and described by terms such as ‘delight’, ‘fun’ and ‘surprise’.

However, the focus of our discussion is the exploration of peoples ‘lived’ experiences in order to define strategical concerns that preempts the ‘making’ or ‘curating’ of the DLE phase of Experience Design. We term this strategic concern Experience-led Design (ELD) as it is based on the premise that in order to create appropriate future experiences for people, designers need to first understand the current and past experiences of their users.

---

3 Technology is used here, synonymously with ‘design’ to refer to any artificial system and includes organizational change, systems change and artefactual design.

4 For example, see Roman (2016) and Hermann (2016).
In order to determine what should be created, referring back to our earlier discussion on design strategy, ELD can be considered an act of high-level design strategy while DLE, which when selected in a rigorous manner is an output of ELD, relates to product-orientated design strategy.

Fundamentally in the Understanding Phase of Design Thinking, ELD seeks to establish a phenomenological/pragmatic (Benyon, 2014, p. 21) interpretation of what ‘positive’ experience may entail for users. As such identifying these experiences requires an exploration of users’ life-experiences (Wright & McCarthy, 2010, p. 3).

While there are numerous research methods for exploring people’s life-experiences, the primarily interest of this discussion is the research design of the exploration, so as to ensure that emergent insights are useful in reflecting what is desirable to those affected by the design problem. To this point in we have found it useful to apply in our teaching, Marc Hassenzahl’s (2010) *The Three Level Hierarchy of Needs* model (see Figure 2) to guide research (Fenn, 2015) and strategy design (Fenn & Hobbs, 2017).

Hassenzahl suggests that positive experience equates to positive need fulfillment (2010, p. 3). *The Three Level Hierarchy of Needs* model, (2010, p. 44), based largely on Activity Theory (2010, p. 11), suggests that in order to establish an understanding of what users need (and by extension the fulfilment of such) requires an understanding of human need as embedded in motivated action.

Hassenzahl’s framing of motivated action describes WHAT?| DO GOALS (middle level of the hierarchy) as the instrumental goals that describe what action the user needs execute to achieve a particular goal. Examples of WHAT? goals could include ‘buying a new car’ or ‘making a phone call’.

Each WHAT? Goal in turn, consists of a range of operations (the HOW?| MOTOR GOALS at the lowest level of the hierarchy) that collectively describe how the WHAT?| GOALS are embodied. To extend our car purchase example these would include the particulars of how the user engages with the designed system to achieve their goal, so for instance this might include operations such as ‘locate dealership’ ‘select make’ ‘select color’ etc.

At the top level of *The Three Level Hierarchy of Needs* are the WHY?| BE GOALS. These goals describe the motivational drivers that provide meaning and the rationale for the WHAT? goals. Returning to our example, the user may want a new car for any number of motivational reasons such as the belief that purchasing a new car will make people think they are successful; or that they are frustrated with an old constantly breaking one; or that they are expecting a baby and need a safer option.
WHAT? goals are of particular use in the hierarchy as people to tend to be aware of their goals and can generally express them (Kaptelinin & Nardi 2012: 30). Once WHAT? goals have been identified they can form the conceptual gateway for the designer to access both the upper motivational needs as well as the lower operational HOW goals. This is because WHAT? goals tend to remain fairly constant over time and context. For example, purchasing personal and reliable transport is an age old activity. WHY? And HOW? goals tend to change depending on circumstance. How, I purchase a car using digital channels is very different to my father’s experience at a dealership thirty-years ago. Likewise, WHY? goals are subjective and likely to change depending on context. Additionally, WHY? goals are often tacitly unconscious to people unless directly reflected upon. Thus, an enquiry into why a user performs an action is more likely to yield a useful result as opposed to asking the user to directly explain their ‘life’ motivations.

In order to assist designers in identifying WHY? | BE GOAL Hassenzahl suggest using Sheldon et al (2010, p. 46) framework that lists the ten most frequent and reoccurring human needs that motivate action.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>The Top-ten most common psychological needs (Hassenzahl 2010 p 46)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autonomy/Independence</td>
<td>Competence/Effectance</td>
</tr>
<tr>
<td>Self-actualization/meaning</td>
<td>Security/Control</td>
</tr>
<tr>
<td>Influence/Popularity</td>
<td>Physical thriving/Bodily</td>
</tr>
<tr>
<td>Pleasure/Stimulation</td>
<td></td>
</tr>
</tbody>
</table>

Hassenzahl (2010, p. 46-49) describes these top-ten psychological motivations as not always all present in every situation or equally intense. However, they do provide a valid, if somewhat broad, categorical framework for identifying and organizing human motivation.

---

5 Shedroff & Yaven’s (2015) ‘15 Core Meanings’ presents a very similar set of needs to Sheldon’s Top-ten Psychological Needs.
Once WHY? goals have been identified, strategically speaking, they are very powerful drivers for establishing design intention. Establishing WHY? goals make it possible to consider other modes of addressing the identified problem. These could include:

- **Re-thinking HOW? | Motor GOALS to better support existing WHAT? | DO GOAL and related motivational drivers.** For Example, if our car purchaser’s core motivational need is ‘safety’ they may be supported operationally by providing timeous feedback on financial transactions, so they don’t worry about the integrity of the transaction.
- **Conceiving of additional alternatives that support the current WHAT? |Do Goals.** For example, to offer extensive car safety devices such as ‘baby-seats’
- **Conceiving of fresh alternatives that replace the current WHAT? |Do Goals.** For example, creating awareness of the safety of the existing public transport system and the easy option of cheap weekend car rentals as opposed to individual direct purchase of a vehicle.

Up to this stage our discussion has centered on two main themes.

Firstly, we have identified the need for students to be able to develop strategy not only for design products but also in order to determinate design responses to wicked problems.

Secondly, we have established that experience factors are not of a universal type but need to be defined during design research. We have also introduced the concepts of a hierarchical structure that explain activity as orientated towards motivational factors. We have suggested that for design students, the hierarchical structure can guide design research exploration. Lastly, we have suggested that the Top-ten psychological needs framework can help designers identify when a motivation presents itself during research enquiry.

We have noted that there is a clear overlap between wicked problem framing and Experience-Led Design. We believe that the structured approach to accounting for motivated presented by Hassenzahl, is a valuable theoretical device for structuring a strategic response to complex problems that articulate human need. Thus, in the remainder of this paper, we discuss how these theories of activity can be integrated with strategic thinking and how the resulting concept can be articulated in two visual tools to assist students to structure their design thinking in a manner that ensures research insights directly impact of subsequent product-orientated design strategy.

**Articulating strategy**

Although the purpose and practice of Strategy takes many forms depending on the discipline and context in which it is being performed, it is broadly understood as a deliberate choice and combination of activities and actions to deliver a unique value proposition (Porter 1996, p. 63-69) under varying degrees of certainty.

Developing new strategy, which is typically required when addressing wicked problems, tends to take place under conditions of high uncertainty that include but are not limited to influences such as users, stakeholders, business competitors, macro and micro-economics, society, culture, natural and technological environments, as well as the internal dynamics of organizations, etc. (Hobbs & Fenn, 2015, p. 271-282). Strategy operates over a long-term, and thus, sustainability is a key factor in for assessing successful implementation...
Strategy, can thus be considered the creation of a plan that resolves a particular set of concerns and that is sustainable under conditions of uncertainty.

While others definition of Strategy (Miller, 2016, p. 123, Wright in Dunne, A., & Raby 2013, p. 4) exists they tend to conceptually overlap with Richard Rumelt (2012, p. 77) ‘Kernel of a Good Strategy’. Rumelt refers to the ‘kernel’ of strategy, as a generic framework for sound strategy development that “…leaves out visions, hierarchies of goals and objectives, references to time span or scope, and ideas about adaptation and change.” (2012, p. 79). Rumelt describes the Kernel (2012, p. 77) as follows:

1. A diagnosis that defines or explains the nature of the challenge;
2. A guiding policy for dealing with the challenge; and,
3. Coherent actions designed to carry out the guiding policy.

The kernels ‘diagnosis’ refers back to our discussion on the Understand Phase of the Design Thinking process related to the framing of wicked problems. Invariably in a HCD project, the problem that requires framing is complex as it involves multiple role players such as users, stakeholders, and business with multiple subjective needs operating within larger socio-cultural, economic, political and historical contexts. Diagnosing the problem thus involves identifying:

- Which problems can be addressed in the design project given the time, knowledge and resources available;
- And; why these problems are worth resolving.

The ‘guiding policy’ is informed by the ‘diagnosis’ from the perspective of HCD, is the outcome of the synthetic resolution of the complexities of desirability, viability and feasibility.

The ‘Coherent actions’ provide a reframing of what is towards what could be by providing the requirements for what the design solution should provide. Thus they describe a set of conditions, which must occur in order for the guiding policy to be implemented.

**Experience-led Strategy Framework**

In order to assist student to develop their own strategy, we use a basic template as shown in Table 2, which integrates Rumelt’s strategy kernels with motivational needs (which we refer to as psychological drivers in the framework) derived through the student’s user-research and guided by the *Top-ten most common psychological needs* framework (see Table 1).
Table 2  An Experience-led Strategy Framework

<table>
<thead>
<tr>
<th>Rumelt’s ‘kernel’</th>
<th>Principle</th>
</tr>
</thead>
<tbody>
<tr>
<td>“A DIAGNOSIS THAT DEFINES OR EXPLAINS THE NATURE OF</td>
<td>[Users] are unhappy about [X] because certain psychological needs [A], [B], [C] are not being met. This is because: Contextual factors for [A] to occur Contextual factors for [B] to occur Contextual factors for [C] to occur</td>
</tr>
<tr>
<td>THE CHALLENGE”</td>
<td></td>
</tr>
<tr>
<td>“A GUIDING POLICY FOR DEALING WITH THE CHALLENGE”</td>
<td>By changing [X] to [Z], users will achieve [A], [B] and [C] and thus [amended action/emotion will occur]</td>
</tr>
<tr>
<td>“COHERENT ACTIONS DESIGNED TO CARRY OUT THE GUIDING</td>
<td>In order to achieve [Z] and thus ensure [A], [B] and [C], we will need to do: Change action/s for [A] to occur Change action/s for [B] to occur Change action/s for [C] to occur</td>
</tr>
<tr>
<td>POLICY”</td>
<td></td>
</tr>
</tbody>
</table>

Firstly, it is worth emphasizing that an Experience-led Strategy Framework describes high-level strategy. This strategy definition typically takes place after the student has undertaken a broad exploration of the general design problem area as well as conducted in depth research focused specifically on user-communities. Thus the students’ Strategy Framework is complimented and supported by other deliverables such as problem ecology maps, personae, experience maps and literature reviews. Experience-led Strategy Framework, therefore are not an attempt to optimize the research process into three steps but rather to help student clarify their thinking.

In the Diagnostic Principle, students are expected to identify their user community, frame the specific problem their users face, and, identify how the conditions of the problem prevents the user from achieving their motivational need (and thus not realizing their preferred situation of the experience. The Diagnostic Principle is purposely concise in order to force the students to prioritize the most important aspects related to resolving the problem. This does not mean other rich details related to the problem area are expunged from the thinking process, however, it does imply that they are subordinate to the most important conditions for success to occur.

The Guiding Policy Principle describes the transformation that the design hopes to implement and the subsequent affect that the change have on the user psychological and pragmatically.

The Coherent Actions Principle describes the actions required to support the transformation. These actions are in essence the conditions that must occur for the problem to be resolved. There is a relationship between the ‘contextual factors’ in the Diagnostic Principle and ‘change actions’ in the Coherent Actions Principle which ensures
that the conditions of resolution are reconciled with specific contexts of the problem in order to ensure the integrity of the research finding inform the design strategy and subsequent solution. Initially, when we first used applied Experience-led Strategy Frameworks in teaching, we did not use the [A, B, C] indexical log as indexically channeled as is shown in these examples. We found that students did tend to conceptually drift in the sense that their cohesive actions did not always relate back to the original psychological needs. Using a more ‘channeled’ approach helped the students to ensure the golden thread that tied design ‘action/s’ to reciprocal design ‘problem/s’. It is also worth mentioning at this stage we don’t always expect a 1:1 needs: cohesive action pairing. Often the cohesive drivers can, for example, reflect two distinct needs, or, two cohesive actions can respond to one need. It is also important to emphasize that coherent actions are proposed requirements and do not describe the design solution itself. The application of coherent actions is not to define the design solution but to rather create a space for creative exploration with in the broad parameters of resolving the framed problem. Figure 3, below, is a student example of the Strategy Framework in practice. This example provides a design strategy related to the complex problem of motivating the youth to study or actively seek work.

Figure 3  Student example of an Experience-led Strategy. Source: M Zulu, University of Johannesburg
Experience-led Relationship Models

Experience-led Relationship models (ERMs), Figure 5, are visual design tools that assist students to firstly, identify appropriate experiential factors to embody in their design solutions and secondly, to widen the focus of their ideation.

In terms of identifying appropriate experiential factors; ERMs model the relationship between the psychological needs of users, the strategic actions required to resolve the problem (the cohesive actions), and, the appropriate experiential impact of the solution. In essence, ERMs connect the emergent user motivations derived during Experience-led Design research with the emotive factors required in the crafting of Design-led Experience. In the innermost ring of the model are the psychological needs identified in the research using the Top-ten psychological needs framework and are the same as those in the student’s Experience-led Strategy Framework. The coherent actions derived in the Experience-led Strategy Framework are placed in the middle ring of the model. Coherent actions should relate to their appropriate psychological drivers, however, there could be more than one coherent actions to each psychological driver. In the outermost ring, the experience drivers are placed.

Considering what is the most appropriate experience is the fundamental conceptual activity of a ERM. An emotional driver is expressed as a feeling. The intention is to select what feeling best matches the corresponding psychological driver in the context of the cohesive actions and broad problem scope. By selecting the feeling in reference to the cohesive driver the broad, categorical looseness of the psychological driver becomes defined, purposeful and immediate. For example, the psychological driver Security/Control in the context of the need to ‘provide structure and order’ for children in
families going through a divorce could result in the required emotive value of ‘loved’. This would be vastly different to Security/Control referring to the need for ‘structure and order’ by residents of an inner city suburb best by criminal activities.

Selecting the ‘right’ emotional driver is an iterative reflective process which tests not only the semantic implications of each feeling but also the selection of the related cohesive action in the pursuit of combinations that best reflect the students strategic framing of the problem. Often this can result in returning to the Experience-led Strategy Framework to implement more considered actions. However, the psychological driver should not ever change as this would negate the entire research process.

Figure 5  A student example of an ERM, which relates to the Strategy Framework described in Figure 4. Source: M Zulu, University of Johannesburg

Figure 6  Another example of student ERM. This model shows the sets in a column format rather than the circular model of the template but achieves the same purpose. Source: N Delgado, University of Johannesburg
Once, the ERM is complete it can be applied to generate the initial concepts for the design solution. The focus of the ideation at this stage is at a high-level and seeks to identify general products, services, activities and delivery channels rather than detailed product design. The purpose of applying the ERM during high-level ideation is to ensure that firstly, experience factors are used in the initial phases of design to consider what should be designed rather than only how solutions should be designed and secondly to ‘force’ students to consider other factors in their solution thinking other than those that first come to mind.

The ideation process that we apply in our teaching, using the ERMS is as follows:

1. Place all cohesive actions and related experience drivers into their sets.
2. Ideate, through text or sketches, design concepts that fulfil the conditions of the set.
3. Using the other experience drivers in turn consider how the concepts ideated in the particular set could be altered by considering the other experience drivers.
4. Repeat this process with the other actions/driver sets.
5. Lastly, while considering all the actions/driver sets select the concepts that could potentially cohesively integrate into a final high-level concept, and, address all cohesive actions.

Figure 7 Illustrates the first 4 steps of the ideation process. The different colors denote the integration of all the experience drivers within the particular action/driver sets. Source: N Delgado, University of Johannesburg
In summary and as shown in the students’ examples, ERMs ensure that psychological motivations orientate the design solutions and that they ensure Experience-led Design informs strategy. As such they describe:

- The most appropriate psychological needs required to fulfill users’ motivations.
- The coherent actions that contextualize the psychological drivers in relationship to the ‘guiding policy’ of the strategy.
- The emotional responses experienced by our users as a result of the designed solution (the ‘reflective’ experience drivers)
- ERMs ensure that psychological motivations become the design solutions’ reason for being and they orientate experience as strategy.

**Conclusion**

Preparing design students to embrace complex societal problems by supporting them in strategic decision making is the central concern of this paper. The resulting outcome of this intentions is to improve the students’ capabilities in producing effective design solutions that speak to the real needs of people and thereby contribute effectively with and in society.

In line with this objective, this paper presents an overview of a number of theoretical positions related to design thinking, experience design and strategy. Firstly, the contexts of developing design strategy in response to indeterminate problems are discussed particularly in terms of how high-level design strategy thinking differs to that of product-orientated design strategy. Secondly, aspects of Experience Design that relate to high-level design strategy conceptualization are articulated. In reference to this point, theoretical accounts that describe the hierarchical relationship that orientates action and behavior to human motivation are introduced. These theories, we suggest, are useful for structuring the notion of motivation as a strategic intent. Next, Richard Rumelt’s framework for strategy is introduced and described with the intention of providing a solid structure in order to conceptually integrate aspects of activity theory.

The overview is followed by a discussion rationalizing how aspects of these theories can be integrated firstly, into a theoretical framework for conceptualizing experience-led
strategy and secondly, into two visual design tools that support students’ ability to develop experience-led strategy. These tools; Experience-led Strategy Frameworks and Experience-led Relationship Models are presented, explained and exemplified in a range of student work.

While, we believe this paper provides a thorough theoretical account of how these tools were devised, and that they in our experience in application been proven be useful and valuable, we do recognize that subsequent research is needed to rigorously validate their worth.

Acknowledgements
The authors would like to gratefully acknowledge the cooperation and enthusiasm of the students who contributed directly or indirectly to the research presented in this paper.

References
Brown, Tim. 2(008). Design Thinking, Harvard Business Review, June. 84-95
Hassenzahl, M. 2010. Experience Design: Technology for All the Right Reasons. San Rafael: Morgan & Claypool,


About the Authors

**Terence Fenn** lectures User Experience and Interaction Design in the Department of Multimedia, at the University of Johannesburg. His current research interests include design research, blended spaces, speculative design and Afrocentric Interaction Design.

**Jason Hobbs** has been a director of UX and IA design firms and has over twenty-years industry experience. Has lectured part-time in the Department of Multimedia. Current research interest is the role of information architecture in poetics of meaning making.
In response to the changing face of design professions, there is a growing need of integrating participatory practices into design curricula to equip students with the required competences. We have been running participatory scenario building projects since 2010 as part of the 3rd year studio at the Industrial Design program at our university. This paper explores a participatory design project conducted in collaboration with a neighbourhood association and a private primary school in the neighbourhood focusing on sustainability scenarios for post-use. Based on interviews with the industrial design student teams, we investigate the role of multi-stakeholder participatory projects in industrial design education, and discuss the learning outcomes from the students’ experience. Our findings underline the importance of providing the students with regular encounters with multiple stakeholders in fostering openness and flexibility in the students’ self-image as designers, and knowledge of, and versatility in adopting the approach and methods required by the context.

keywords: participatory design; design education; sustainability scenarios; designer identity

Introduction
Industrial design education has been in a state of flux as the profession keeps overstepping the boundaries of its traditional subject matter of shaping mass manufactured products. On the one hand, since as early as the 80s, industrial design
started to move from engineering-led perspectives towards marketing and business-related practices, including an increased emphasis on innovation (Wormald and Rober, 2008). This meant the relocation of the field to include systems thinking and design-driven innovation, as designers are expected to work in collaboration with others to solve complex problems (Boyar斯基 1998; Kolko 2005; Kiernan & Ledwith, 2014). On the other hand, there is an accompanying move from product-centred understandings of design towards human-centred approaches onto participatory frameworks that increasingly involve users not merely as informants but as participants and fellow decision makers, often with a nod to democratic and anti-consumerist ideals (Kensing & Greenbaum, 2013; Sanders, 2002; Sanders & Stappers, 2008). “The vanishing of the product” and its substitution by “process” and “context” (Findeli, 2001) in industrial design has meant that the profession shifts towards newer areas such as service design, social design, design for sustainability, and experience design (Kiernan & Ledwith, 2014).

In the face of the changing definitions of the profession, design curricula are required to revise the skill sets they deliver to their graduates. In conclusion to their survey of design graduates in Ireland, Kiernan and Ledwith (2014) suggest the relevance of collaboration, business communication, entrepreneurship and research skills as well as the importance of versatility in applying basic design skills in a wide range of projects. Press and Cooper (2003) point to entrepreneurship and social responsibility as significant areas, while Inns (2007) highlights the emergent roles of designers as negotiators, facilitators and visualizers.

Within the larger context, teaching participatory practices together with related research and collaboration skills has become a requirement for design curricula (Stappers & Sleeswijk Visser, 2007). Collaborative encounters between design students and users can be used not only to teach students participatory techniques but also to foster many of the above-mentioned skills and competences. With this in mind, we have been running participatory design projects on developing future sustainability scenarios since 2010 as part of the third year studio at the Industrial Design program at our university. During our collaborations with external partners, we have developed a project model that values realistic encounters with stakeholders in design education while at the same time building long-lasting relationships with our collaborators to foster community development. In this paper, we build on our collaboration in 2015-16 fall semester with a neighbourhood association in the vicinity of our university and a private primary school in the neighbourhood, discuss multi-stakeholder participatory projects in the context of industrial design education, and identify an encounter-based approach to the integration of participatory practices into education. We ask two questions: How do students experience participatory practices with multiple stakeholders in industrial design education? Which aspects of their experience impact the key learning objectives?

In the following sections, we first review the literature on participatory design (PD) with emphasis on learning. We continue by describing our research design, and our “sustainability scenarios” approach. Finally, we present our findings and conclusions.

**Participatory design and mutual learning**

Participatory Design is based on “the direct involvement of people in the co-design of tools, products, environments, businesses, and social institutions” (Robertson &
Simonsen, 2012). It is a new “mind-set” that represents a shift from “designing for users” to “designing with users” (Sanders, 2002). It supports and benefits from “the genuine decision making power of the co-designers and the incorporation of their values in the design process and outcome” (Van der Velden & Mörtberg, 2015, p.42).

In their review of early PD practices, Kensing and Greenbaum (2013, p.33) list the six guiding principles of PD: “equalising power relations”, which aims to make the voices of invisible or weaker social groups heard; “democratic practices”, which foster equality amongst stakeholders; “situation-based actions”, by which designers can access users’ actual practices and not merely their abstractions; “mutual learning”, through which stakeholders can establish a common ground to collaborate on; related “tools and techniques”, and “alternative visions about technology”.

The current literature on PD seems to give weight to these principles differently. For instance, one important distinction can be made between a more politically conscious strand of research that adheres to the democratic ideals of the earliest “Scandinavian” projects, and other approaches that concentrate their efforts on developing new tools and techniques for increasing end user involvement in earlier phases of design processes (for the latter, see for instance Levitt and Richards, 2010). Representing the former camp, Kensing and Greenbaum (2013, p.27) differentiate what they call genuine participation from “user empowerment”, a term that the authors themselves place in inverted commas. While the latter involves their users as informants within processes on which they have little control, genuine participation emphasizes the need to give users a place in actual decision making. Similarly, Sanders’ (2008) map of design practice and research distinguishes the Scandinavian tradition with its research-based aspirations, from generative approaches that prioritize developing tools that help non-designers communicate their needs and desires.

In design educational settings where the sensibilities of PD are integrated, on the other hand, we can argue that mutual learning becomes the dominant principle. Mutual learning is the sharing of know-how and values among designers and all stakeholders. Designers develop understandings of the users and use contexts while users gather knowledge on design and technology (van der Velden & Mörtberg, 2015; Robertson & Simonsen, 2012). Through mutual learning, design students can acquire ethnographic sensibilities that prioritize understanding people in their own terms for a situation-based approach to design, and experience how establishing a common ground and equal relations can benefit the design outcome. Yet, building rapport and understanding takes time. Inclusion of the stakeholders themselves in design education projects also helps students appreciate the significance of in-depth research and problem structuring by slowing down decision making, calling for constant reflection and negotiation (H. Lahti and P. Seitamaa-Hakkarainen, 2005).

Mutual learning also means that each party learns about themselves by closely examining and reflecting upon their own practices. Van der Velden and Mörtberg (2015, p.46) warn that designers should be equally willing as the other stakeholders to open their own expertise to negotiation, making their values and norms transparent to the learning process. As Suchman (2002, p.95) argues, traditionally “designers are effectively encouraged to be ignorant of their own positions within the social relations that comprise
technical systems, to view technologies as objects and themselves as their creator.” Conversely in the PD approach, designers are required to share their decision making powers and acknowledge the users’ expertise (Bratteteig & Wagner, 2014). This means delegation of power and agency to other stakeholders, which can be experienced as loss of control by the designer (del Gaudio et al., 2016). Power issues make it necessary that the design process involves constant reflection on issues such as “access, in/exclusion, voice, the dynamics of decision-making” (Bratteteig & Wagner, 2014, p.6). In educational settings, then, arguing for equality through PD means encouraging design students to constantly reflect on their own roles and expertise as future design professionals.

In sum, we can propose three learning objectives associated with the inclusion of PD in design education:

- developing the attitudes, and learning the tools and techniques that are necessary for developing in-depth understanding of users and use contexts;
- developing the facilitator skills for collaborating with stakeholders with varied expertise, competences and positions, including engaging in negotiations and compromise, and sharing one’s hold over decision making;
- learning to reflect upon one’s own position, role and expertise, values and norms in a situation-based manner.

Even though the advantages are apparent, the literature on PD does not provide comprehensive suggestions as to the specific ways in which participatory practices and associated ideals can be worked into design education. As Lahti and Seitamaa-Hakkarainen (2005, p.114) note, ensuring continuous participation in educational settings is difficult, and participation “must be intentionally designed into” projects. In this paper, we aim to outline one such approach that considers the process as a series of encounters.

Research design

The empirical basis of this paper is constituted by semi-structured interviews with student teams, which aimed to gather the students’ experiences of the encounters that make up the project phases. 56 students in 11 teams had taken part in the project; 30 students in 9 teams were interviewed one year after the completion of the project. The last interview was used as a member check (Creswell, 2014) to validate our early findings. We also conducted supplementary interviews with our collaborating partners in order to cross-check our findings with our collaborators’ points of view, including an interview with the association’s chairperson, and at the private primary school, interviews with the founder’s representative, the head of the primary school, a curriculum development expert, and three class teachers. We also utilized the project documentation including briefs, assignments, submissions, audio and visual materials, and our observations throughout the process.

All student teams were contacted via e-mail and asked for their appropriate time to schedule an interview for the research project. Special attention was paid to include at least three members from each team, even though two of the interviews had to include only two members due to scheduling problems. Two of the authors conducted the interviews with the teams, the duration of which ranged between 35 minutes to one hour.
We recorded all interview sessions with the consent of the participants. The data were analysed through thematic analysis.

Conducting the interviews one year after the project had its challenges. In case remembering the project became an issue, we started the interviews by going over the project calendar and showing the project outcomes. On the other hand, the time that has passed helped the students reflect on and evaluate the process and the learning outcomes of the project from a more distant standpoint.

**Participatory design and future sustainability scenarios in third year industrial design studio**

Since 2009 the third year industrial design studio has been developing a design education approach which fosters a design for sustainability mind-set. The educational projects conducted in collaboration with non-profit organizations as well as industrial partners explore issues, contexts, materials as well as design approaches, methods and tools which prioritize design for sustainability. During the design process the students are exposed to various sustainability considerations such as design for post-use, design for personalization, efficient use of resources, and local knowledge and skills. Developing design research skills such as user observation and interviewing, and experiencing various design approaches, methods and tools such as “Matrix” idea generation, design inspired by nature, open design, participatory design and scenario building are also incorporated into the studio practices (see for instance Turhan et al., 2011; Korkut & Dogan, 2010; Hasdogan et al., 2006).

“Dream Campus”, a project we conducted in 2010, was the first project through which we explored a participatory design approach for building future sustainability scenarios with the involvement of our university campus community. This initial experience has put us in touch with colleagues who care for fostering similar values, and as a result, we were introduced to a potential external collaborator, a neighbourhood association in the vicinity of the campus. Between the years of 2012 and 2016 we conducted four participatory design projects in collaboration with the association; over the years, 189 students took part in these projects focusing on specific themes: “Dream Neighbourhood”, “Neighbourhood Identity”, “Post-Use Scenarios”, and “Inclusive Neighbourhood”.

The projects typically start with a kick-off meeting at school to introduce the brief and the major collaborator—the leading members of the association—to the students of the third year design studio. Following the introduction, together with the students we make a field trip to the neighbourhood to get familiar with the association and its premises, to conduct short interviews with the residents and other stakeholders such as shop owners and teachers, and to take photographs to document the key observations. Back at the studio, the student teams analyse the data collected, and present the key interview excerpts, findings and insights together with the visual material. Then, the teams identify alternative problem areas in the form of HMW (how-might-we) questions and prepare the drafts of six-frame scenarios. At this stage, we invite the members of the association and the representatives of other stakeholder groups to negotiate the problem areas and priorities, and receive initial feedback on draft scenarios. After further developing the scenarios, the students set up an interactive exhibition and share the draft scenarios and mock-ups with
the community in a central shopping area in the neighbourhood. Based on the feedback received, each team prepares two alternative scenarios accompanied by system diagrams and/or tangible outcomes to increase the visibility and the impact of the solutions they developed. After a discussion session with the association and the stakeholder groups, the teams finalize their projects and make a final presentation to the stakeholders.

Empowering the neighbourhood: Sustainability scenarios for post-use

For the participatory design project for the 2015-16 fall semester, we collaborated with the neighbourhood association and a private primary school at the neighbourhood. Teams of 5-6 students were asked to develop two diverse sustainability scenarios that encourage sustainable consumption patterns and behaviours through post-use, including sorting, labelling, transporting, storing, re-purposing, repairing, reusing and recycling various unused household items and waste, in the neighbourhood. Working with the association, residents and children, the teams identified problems, and developed design solutions in the form of scenarios, supported by a system solution that distributed roles and defined relationships among different actors, and a product solution as part of the system. The main target group for the project was children between the ages of 6 and 13, as this was considered an effective way to foster consciousness in the neighbourhood.

The project took seven weeks, starting with a field trip to the neighbourhood for observations and interviews, continued with the analysis of the collected data to identify problem areas and project themes. Teams then sketched initial scenarios, which they developed in successive weeks in a series of encounters with different stakeholders. Each week, students met with a stakeholder group in the form of a workshop or evaluation session, until the final evaluation in which they presented their design solutions in the form of storyboards, system diagrams and models. (see Figure 1 and Table 1)
Figure 1  Snapshots from the project process. From left to right; top row: Visiting the neighbourhood, workshop with children; bottom row: interactive exhibition at the neighbourhood shopping centre, final presentation

Table 1  Project stages

<table>
<thead>
<tr>
<th>WEEK #</th>
<th>PROJECT STAGE</th>
<th>PURPOSE</th>
<th>EXTERNAL ACTORS</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEEK 1</td>
<td>Workshop on teamwork</td>
<td>Develop teamwork mind-set</td>
<td>A teamwork expert</td>
<td>3rd year Industrial Design Studio</td>
</tr>
<tr>
<td></td>
<td>Field research and user interviews</td>
<td>Collect data regarding post-use strategies, dreams, visions</td>
<td>Association members, neighbourhood residents and children</td>
<td>Neighbourhood</td>
</tr>
<tr>
<td>WEEK 2</td>
<td>Analysis of findings</td>
<td>Identify problems, gather insights, locate themes</td>
<td></td>
<td>3rd year Industrial Design Studio</td>
</tr>
<tr>
<td></td>
<td>Scenario building</td>
<td>Develop personas and scenarios</td>
<td></td>
<td>3rd year Industrial Design Studio</td>
</tr>
<tr>
<td>WEEK 3</td>
<td>Participatory scenario</td>
<td>Act out and evaluate scenarios with children</td>
<td>Schoolchildren</td>
<td>Primary school library</td>
</tr>
</tbody>
</table>
In the following section, we focus on four of these encounters, specifically on those that took place outside the studio environment. We start by discussing the students’ reactions to the project in general to set the stage for our analysis of the encounters separately. The first encounter we focus on is the field research in which the students met with the association for the first time, where we examine the students’ view of the association. Next, we move on to the two workshops at the primary school to describe the students’ reflections on the process and on children as primary users. Thirdly, we investigate the encounter with the community members at the neighbourhood shopping centre, and dwell on the teams’ experiences. Our analysis highlights the students’ perception of the project, of the stakeholders—including their motivations, competences and benefits from the collaboration—and of themselves as designers and students.

**First encounter with participatory design and scenario building**

As indicated earlier, each student team was expected to develop two diverse sustainability scenarios and each scenario was expected to address an identified “problem” and propose a “design solution” together with a “system” which identified the relationships among actors, activities, strategies and tools. The interviews indicate that the project was new, unusual or atypical for the students both in terms of process and outcome. The project was not only their first experience in participatory design process, but also first experience in building sustainability scenarios and system diagrams.
First and foremost, there were comments which drew attention to the scope of the project and the students’ assumptions concerning the core professional duties of a designer. One student argued that among the students in the department there was a basic assumption that “system design” was “not the duty of designers.” Another student stated that they had considered “social design” outside their field. A few teams stated that this project was their first experience in “service design;” according to one team, they realized for the first time that the service could also be “a matter to be designed.” There were also statements which referred to the project as a “non-commercial social responsibility project” or simply as “providing help” for the neighbourhood.

Concerning the project outcomes, a number of students referred to their feeling shocked, disappointed or dissatisfied by the non-product focus of the project. Some students indicated that they expected to design products which would look beautiful in their portfolios. Since the project focused on the development of scenarios and systems, there was little time left for finalising the tangible “product outcomes” which accompanied the scenarios, and they were not impressive or “beautiful”, and therefore, not ideal as portfolio material. Although there were comments which described the process as “different” and “valuable”, and as including special experiences such as interacting with children, the students expressed that they did not know how to present the project context, the process and the scenario-system outcome informatively and persuasively to a “general audience” in their portfolios. Another difficulty mentioned by a student was moving from scenario-system building to designing tangible outcomes: “What are we going to design exactly? The transition from scenario-system to product is a challenge.”

Despite the feeling of uneasiness about the non-product character of the project, the experience of building scenarios and system diagrams was described as useful and effective for “going beyond the product-designer relationship”, for “forcing [the designer] to take every detail into account”, and for “identifying actors, filling in the gaps and building a sustaining system.” One student described what they accomplished as follows:

*The neighbourhood realized that they could build a better system with what they already had; we identified all the system components and assigned a role to everyone. Based on whatever available we suggested something really attainable.*

Reflecting on the project retrospectively, another student stated that they consistently employed the “thinking strategies” and scenario building skills in later projects.

Student interviews highlighted a number of roles and responsibilities a designer may need to take in a multi-stakeholder participatory design process. Many students from different teams characterized the major role of the designer in a “social” project as mediator, coordinator, communicator, collector and analyser of information, and synthesizer of insights and findings. The designer in those statements was “right in the centre” or “a bridge in between.” The students also drew attention to the role of designer in identifying problems as well as developing solutions.

As the discussion shows, as industrial design students using a participatory approach and doing a scenario-based design project for the first time, from the very beginning they were perceptive—some were even sceptical—towards the project. They questioned how the project fit in their education so far, and assessed the value of the experience in terms of
both their learning and their future careers. In the following chapters, we examine the specific ways in which such ponderings related to each encounter.

**Encounter with the world of a community organization**

As we discussed above, the project was part of a series of collaborations with the neighbourhood association, who was, from our point of view, the main, long-term partner. We dedicated our second studio session to a visit to the neighbourhood, where we expected the students to make observations, take photos and make visits to neighbourhood homes and shops that were assigned to them by the association. This was the very first encounter in which the students met the neighbourhood and the association; and in their words, their first educational experience in which they “spoke one-to-one with people who will implement [our ideas]”.

Face-to-face dealings with real world actors is an important learning outcome of a participatory design education project, which was repeatedly indicated by the students we interviewed. As we also discuss in later sections, they were often challenged and inspired by the encounters. In the case of the association, one of the teams that we interviewed assessed the encounter as follows:

> Going to the association and seeing what they’ve accomplished, seeing their world, it helped us see what kind of a collaboration we can do with them. It was realistic. It was good that they narrated what they actually experienced themselves. The woman says, I come here on weekends, I sort them out, fold them, etc. Then she says, we have that much space, I pile them over there. [...] [Our project] was shaped according to these.

Spending an afternoon with the association members, touring their facilities as well as a number of houses in the neighbourhood, the students witnessed the association’s “world”, its capabilities and accomplishments so far—particularly, but not only regarding the project the students have been working on. The encounter was “realistic”—a term that came up often in the interviews—helping them flesh out the stakeholder with regard to the problem they would define and the solutions they would generate.

Still, in their visit to the neighbourhood, the students did not only meet their project partners, but also the example of a community organized and working together as an NGO. It was contrary to any expectations they had as students of industrial design to work with for-profit companies, and for most of them, a new experience as an individual. In the face of this, the students said they were inspired by the fact that the community can “make the system work when they have no financial [expectations]”, by their “awareness of being a community” and their “cooperation”. Accordingly, most of the teams felt that the association took the project seriously, that it was motivated towards and capable of implementing the solutions they would develop. This meant the project was “realistic and implementable”.

The student teams’ accounts approximate a picture of the association as a highly self-motivated participant of the project—more similar to a client than a co-designer—who valued the students’ potential contributions as designers (as one team put it, “saw us as designers”), and acted as a gatekeeper to the neighbourhood residents, and thus carried that significance (“as a bridge to the user”) onto the neighbourhood in general. In some
interviews, this was linked with the perception that the neighbourhood was already a community that is capable of solving their problems collectively. Other teams emphasized the influence of the earlier collaborations between the association and our third year studio: “The association could understand and appraise us because they were experienced”.

The association’s perceived experience with design projects was, however, for some teams, a matter of concern. One team observed that the enthusiasm of the association was faltering as they went through so many projects; and another argued that the experience of the association made the project easier for them, and that they “could gain more experience if they worked with a partner who did not know anything [about the process]”. Member of another team expressed this as follows: “The tutors and the association already know each other. Our role is transient, they are here for good.” This seems to have made some student teams question their own role in the project and triggered self-reflection.

The teams’ overview of their relationship with the association emphasizes the influence of perceived realism on the experience of the encounter. In this case, “realism” is used in three different senses: working with an actor from the real world; acquiring an in-depth understanding of that actor, such as their everyday doings and past accomplishments; and lastly, the existence of any prospect of implementation. Self-reflection goes hand in hand with issues of realism, as research done with ethnographic sensibilities supports empathy as well as thinking about one’s own contribution, or it may create anxiety as students feel secondary to those participants that they perceive as more central to the project.

**Generative encounters with the world of children**

We designed two separate workshops at the neighbourhood primary school, during which the students encountered with third grade children. For the first, the “participatory scenario building” workshop, we aimed to create an environment where students would meet with the target user group for the first time and develop their initial scenarios by observing the capabilities, skills and interests of the children. Before the workshop, students were given suggestions on how to interact with children. At the primary school, students acted out the activities they designed in order to describe their initial scenarios to the children and to receive their help and suggestions to develop the scenarios further. Two children were assigned to each team and the activities lasted for two hours. At the end of the session, children were awarded “design monster” badges.

At the second, the “participatory evaluation” workshop, having developed their projects further through various encounters with different stakeholders, students revisited the primary school to share their scenarios with a different class of third grade children. During the workshop, the students described the scenarios to the children and let them build, personalize and use the mock-ups in order to test and refine their designs. Again, two children were assigned to each team and the session lasted for two hours. At the end of the session, children were able to keep the mock-ups as gifts, and also awarded “design champion” badges.

Although the two workshops had different objectives and were designed differently, in the interviews only a few students differentiated them so. Mostly, both were interpreted as
user testing sessions, during which students got insight on a group of target users about whom they had little or no prior knowledge and experience.

One team described the encounters with children as “shocking” by underlining that they had met with the real users for the first time in their education. Another team stated that user observation had never been that real before. Most of the accounts outlined the conflict between what they were expecting and what children really do or like. Still, for almost all teams, understanding children was important because they were the target group, and from the students’ perspective, the primary users in the project. We observed that students put much emphasis on the feedback they received from the children. One group explained how they insisted on developing the design solution that the children were interested in and enjoyed in the sessions, even though the tutors expressed concerns about the safety of the idea.

Another reason why students placed more importance on children’s’ opinion seems to be that the children were characterized as more open and unreserved in their feedback when compared to other stakeholders. As one team put it, “children never lie”. The students could directly see whether the children could perform a certain activity, and whether they would enjoy it and therefore be willing to participate in it. A team narrated how they redesigned their scenario according to the children’s feedback:

If there were no children, it wouldn’t be this scenario. We had a very different scenario in our mind when we went to the school. The [recycled material] collected at school will go to the association. We thought we could role-play part of it. [...] So we built a [cardboard] car to transport what we collected. But the car was only a part of the scenario. It was something we came up with to make the children have fun, to keep their attention with us. But then it became so that we couldn’t take children off the car. So we thought, maybe we can go on with it, because it drew children’s attention that much.

Overall, the teams expressed positive feelings regarding the workshops conducted at the primary school and described these encounters as both “fun” and “useful”. Yet there were also challenges. One challenge was that of familiarity and understanding. Some students stated that they had underestimated the skills and knowledge of the children as they had had little or no experience with children of that age. One team, in particular, suggested that they needed support from a professional into children’s behaviour and thinking.

Another challenge was about communication. For both of the workshops we specifically encouraged students to convert their scenarios into activities, such as building together, drawing and colouring, and roleplaying, in order to engage the children. Still, during the interviews, students indicated children’s short attention span and how difficult it was to motivate them. It was commonly stated that explaining scenarios to children did not work, as children easily got bored. Some teams emphasized roleplaying to keep the children active and interested. All in all, the strategies they developed with children exemplify how engaging with different actors made students evaluate their approaches to improve the contributions they received by coming up with creative ways to overcome communication challenges.
Specifically, during their interactions with children, students positioned their roles as “playmates” rather than designers. They preferred to play with children as “sisters and brothers” during the workshops as they made their observations. Whilst all teams agreed on this, the teams assessed the change of roles differently. Some teams questioned their role as a designer by stating: “Like a sister, we played. You don’t need to be a designer to do that.” Others stated that although they did not act as a designer during the workshops, they actively did observations and afterwards they evaluated the findings and discussed among themselves how to integrate those to the project.

The students’ accounts underline the significance of generative encounters with real users in real settings, as well as the need to be versatile in applying different approaches as needed. Realistic encounters such as this, and the need for flexibility in adopting roles as required by that encounter, once again, leads to questioning of one’s own roles and competences as a designer. Comparisons among encounters are especially useful for students to self-reflect:

> Children are young, we cannot expect them to see us as designers. [...] They actually saw us as sisters. But other people, people out there, they knew that we were university students. I don’t know whether they knew we were 3rd year students, but still we are almost candidates to being professionals. Mature people not seeing us as designers might have made us uncomfortable.

**A challenging encounter with a qualified community**

On the fourth week, between the two workshops with children, the students set up an exhibition at the neighbourhood shopping centre hall, to receive feedback from the neighbourhood in general on the scenarios they had been developing. Each team set up a table with storyboards and mock-ups, and presented to passers-by in casual conversation. The participants were diverse; including shoppers, shopkeepers, schoolchildren, as well as other residents who were invited personally or via e-mail by the neighbourhood association, who acted as the gatekeeper for the event. Writing the feedback they received on Post-Its, the teams were expected to update their scenarios accordingly for the following week’s preliminary evaluation.

Comparing the encounter to their other experiences, most of the teams had generally negative opinions about the shopping centre experience. One of the teams described it as “uneasy”, specifically in contrast with working with children, which was “fun”. In this section, we focus on the critical accounts with an eye to why and how an uneasy atmosphere emerged, both due to its implications for the way the students were concerned with their professional image and in order to provide a counterpoint to the earlier sections, which provided a relatively positive picture.

Some teams formulated the problem in terms of the participants’ resistance, who they perceived as uninspired by the design solutions themselves (“I don’t need this, because I already [recycle]”), and unbelieving in the possibility of their implementation (“It won’t happen anyway”), and “unappreciative of their efforts”. This was because, the community was “too informed”, and not representative of a more comprehensive sampling; “more rational” when compared to the children who were more “emotional”. In response, the
teams described their main concern as “convincing” the participants—and not, for example, responding to them, co-developing with them, or receiving feedback from them, as it was the case during the earlier steps. One team described the children as “users” and the participants of the shopping centre event as “clients”; another team described their role with the former as “teachers”, and their role with the latter as “salespeople”.

The encounter was such a challenge to them that one team likened the process to a jury:

> At the shopping centre, it was difficult to communicate using the posters [we prepared]. And we were inexperienced. Those who came, they didn’t behave like users. They were like jury members. Everybody was asking questions and making comments from their expertise. If we had explained the project in its final version, they could have visualized it better in their minds. We had the mock-ups, but they weren’t enough; the mock-ups made the project look amateurish.

The quote highlights two further aspects of the way the students made sense of the shopping centre experience. The first of these is the perceived inadequacy of their preparations, including the storyboards and the mock-ups, which both made it difficult to convey their design solutions fully, and disguised the effort put into them. Other teams also emphasized that the format of the presentation they adopted was too strict for presenting “a creative work”, that the style of hand drawing they used on their storyboards was “childish” and “not serious”, and that it was important to “look professional”. Their suggestions included the use of “realistic renders” and “video”.

Secondly, and directly following the first, the quote expresses the students’ insecurity about their self-image. Facing a neighbourhood who acted as experts, the team felt not as designers, but as students in front of a jury. Another team reached the same conclusion, but starting from a different point: “They looked at us as ‘The [university] is here.’ They came and talked to us because they have a positive opinion of the [university]. We didn’t look like designers.”

In sum, those teams that were unhappy with the shopping centre experience, thought of it as an issue about their image and competences as designers. Either they were not given the attention they and their work was worthy of, or their methods were inadequate and had to be rethought. In any case, issues such as problems of communication, difficulties in collaboration or lack of motivation that make encounters difficult or “uneasy” for students have their own benefits in encouraging reflections on methods as well as on the students’ self-image, which are of themselves learning outcomes.

**Conclusion**

Participatory encounters first and foremost mean dealing with future users of products, services and systems in the first person. As the findings demonstrate, in addition to the deep and reliable understanding they enable, face-to-face meetings inspire empathy and respect for others’ capabilities and commitments, and disqualify preconceptions about collaborators in favour of new ideas. For the students, what seemed impossible on the paper became plausible in the field—or vice versa—as they learned not only the methods for, but also the impact of the ethnographic mind-set.
The interviews also reveal the diversity and richness of the roles the students assumed or abided by in each social context. They were playmates, sisters and brothers, teachers, or observers with children at the primary school; students from the neighbouring university, someone from the neighbourhood, or salespeople with the neighbourhood residents at the shopping centre; and a professional designer with the association during the meetings and discussions. Children were considered as users to be observed; the association was the major client, its members were selfless individuals at the neighbourhood community to be inspired by; and the residents were clients to be convinced. As outlined in the findings, the variety of participatory engagements in a multi-stakeholder project obliges the students out of the professional image of the industrial designer they have become comfortable with, to negotiate their image, role and competences vis-à-vis their collaborators, and as demanded by the context of collaboration. It helps them locate, and experience variously locating themselves and their profession. This means questioning (“Anyone can do this.”), expanding (“Service can be […] designed.”) and claiming expertise (“No other stakeholder could have done this.”), or choosing against it (“A small experience before we decide on our specialization...”). Our findings underline the importance of providing the students with regular encounters with multiple stakeholders in fostering openness and flexibility in the students’ self-image as designers.

The findings indicate two aspects of the encounters that have an impact on the students’ experience. The first is its perceived realism. The students’ sense of realism is enhanced by factors such as meeting stakeholders in their everyday settings (i.e. the level of detail); by having first-hand experience of what they can or cannot do, what they have or have not done (i.e. the intensity of contact); dealing with problems in the solutions of which the stakeholders are genuinely interested (i.e. overall motivation). On the other hand, realism may become a challenge when students feel that they are not up to the task, such as when they do not know how to deal with the children; or have the perception that they are not on a par with, for instance, the expertise of the participants of the shopping centre exhibition or the long-term partnership of the tutors and the association. The second is the perceived weight of each stakeholder in the project. Some stakeholders may seem more central to the design solution than even the tutors (children), or less approachable (the neighbourhood residents at the shopping centre). A related aspect may be the contextual qualities and the belongingness of the stakeholders to the environments where they meet; the students’ “hosting” the members of the neighbourhood association in their own studio environment, their “visiting” children in the primary school premises, or their presenting the projects to the community at the neighbourhood’s shopping centre may also have an impact on the students’ experiences concerning the roles they assumed or accepted to take.

Furthermore, each encounter with its specific set of characterizations called for a specific approach, which the students had to prepare for beforehand, struggle with during the process, and review and evaluate afterwards. Inclusion of participatory practices in design education requires fusing various methods including field observations, interviews, structured group discussions, generative workshops, participatory scenario building sessions, and interactive public exhibitions. On the one hand, this enriches the learning outcomes of the overall project by introducing a repertoire of tools and approaches, and more importantly, versatility in adopting, even improvising, the appropriate approach for
context. On the other hand, it requires extensive planning and guidance by the tutors, as well as being ready to respond to the emergent needs of the students and the stakeholders. Especially regarding the latter, maintaining active participation of a large number of people from diverse backgrounds remains as the main challenge.

Acknowledgments

We would like to thank the Baskent University Ayseabla Schools third grade students for their wholehearted and joyful participation in the workshops which have proven to be an invaluable learning experience for our students. We owe special thanks to the Ayseabla Schools Founder’s Representative Hilal Erdinc for fully supporting our collaboration, and to the teaching staff members Ferda Bilgen, Semra Kahveci, Merve Karamemhetoglu, Ayse Ozipek, Asli Uysal and the school personnel for making it all happen. We also would like to extend special thanks to the Cigdemim Association members Fatih Aksoy, Hasan H. Arslan, Turhan Demirbaş, Musa Eraslan, Erdinc Kahraman, Tulay Korkmaz, Mehmet Odabasi, Gonul Oner and Ferit Uyar for their contributions to the process, and to the Cigdem neighbourhood community for their participation in the project. We also owe very special thanks to METU junior year industrial design students for participating in the post-project interviews, and to METU staff members Cagla Dogan, Naz A.G.Z. Borekci, Mustafa Hasdoğan, Aykut Coskun, Anil Ilgaz, Sedef Suner and Senem Turhan for being part of our studio team, to Arsev Umur Aydinoglu for the teamwork training workshop, to H. Tank Sengil for volunteering his expertise to us whenever we happen to need it, and to Ali Gokmen and Inci Gokmen for connecting us with the Cigdemim Association and for their never failing support.

References


About the Authors

**Harun Kaygan** is Assistant Professor at METU, Department of Industrial Design. His work focuses on cultural political contexts of design, including designer nationalisms, biopolitics, open design. He favours new materialist theoretical frameworks and ethnographic methodologies.

**Özümcan Demir** is Research Assistant and PhD student at Middle East Technical University. Her research interests include interdisciplinary collaboration and teamwork, organizational/occupational culture, design management, contribution of design to innovation process with focus of design thinking and service/system design.

**Fatma Korkut** is Assistant Professor at METU Department of Industrial Design (Ankara, Turkey). Her research has ranged over design history, design education for sustainability, idea generation, sustainability scenarios, collaboration models with industry in design education, and design protection.

**İtr Güngör Boncuğcu** (MSc, Industrial Design) is Research Assistant and PhD student at the Middle East Technical University, Turkey. Her research interests include design education with focus on new learning environments, teamwork, online tools, sustainability, design thinking, and system/service design.
Where have all the ideas gone? An anatomy of sketch inhibition among student designers

THURLOW Lisa* and FORD Peter
De Montfort University, United Kingdom
* Corresponding author: lisa.thurlow@dmu.ac.uk

The reluctance of student designers to engage in sketching during the early stages of their processes is an increasing phenomenon, observed on a continual basis within higher education, and one with marked effects on design quality. An investigation into the causes and symptoms of sketch inhibition identifies social, personal and skill-set shortfalls among students together with a favouring of digital tools. A lack of understanding of the functions and benefits of sketching together with an assumption that design sketching is intuitive and requires no tuition have led to its neglect. An anatomy of sketching and its particular qualities is presented, concluding with the issues that higher education needs to address. These include a greater awareness of digital and manual tools and design-specific research types, together with the need for a revised pedagogy for design sketching.

keywords: sketch inhibition; design development; design education; higher education

Introduction

During a studio teaching session, a group of thirteen post graduate students studying fashion and textiles were asked if they felt they could draw. Only two raised their hands. The same group, when asked to imagine and sketch simple forms struggled to produce anything. Some wildly scrubbed away with erasers to remove traces of their perceived ineptitude as they attempted to put their thoughts on paper. Others sat, almost in tears, clearly panic-stricken, unable to pick up a pencil. Many of their sketch-books intended to convey their design development contained little more than collections of pictures cut from magazines and printed from the internet. These were their design ideas. This is how they would create their collections: to them, this was creativity.
In another session, a group of twenty interior design undergraduates were asked to generate sketch ideas for a living space in a six metre cube. One scribbled images of foliage, later explaining that he didn’t want to concentrate on designing the space itself, but rather the surroundings it would sit in. Another took out a small set square and repeatedly drew lines, desperately trying to construct a space in which to map his ideas. An hour later, he was still struggling to visualise a 6m cube. Others complained that they couldn’t think on paper; they sat motionless, complaining they could only develop their ideas on computer.

The truth was they struggled to think at all. As soon as they were permitted to do so, they dashed towards the available Macs to develop their concepts. These ranged from 6 metre cubes containing naïve repeated elements, all straight-line-based, to those containing nothing more than CAD blocks found online. Some looked impressive, utilising the benefits that computers offer the designer: scanned images had been imported to create backdrops to the cube and ultimately convincing presentations, but the results were depressingly and frighteningly similar – an inability to develop complex ideas combined with a CAD aesthetic.

Sadly, this is not the exception; it is becoming increasingly the rule. During eighteen years of my own teaching of design-based subjects in higher education, students are rarely witnessed arriving for tutorials with bulging sketchbooks, with their heads so full of ideas that they have to sit and scribble them down before they evaporate into thin air. Attending tutorials with nothing more than a single thought about what might (or, more accurately, might not), be produced in answer to a problem-based learning activity is the norm. The norm is also to vanish, to spend week after week explaining good intentions without actually putting pencil to paper, to repeatedly apologise for accidentally leaving sketches at home, or to develop a chronic illness that precludes the ability to sketch. Students avoid putting pen or pencil to paper for as many weeks as they can, offering their, ‘great ideas’ in the form of elaborate explanations of ill-developed notions, often based on only a tiny snapshot of a personal observation. They then submit something rendered by computer – something that looks smart and shiny, but actually reflects their limited ability both as designers and as visualisers. The reality is they are suffering a skills shortfall that affects their ability to become effective, creative designers.

Why do so many design students actively avoid putting their thoughts down on paper? What are they missing in not doing so, and it is possible for higher education serve them better? These issues are constantly mooted within higher education and widely bemoaned in industry where the possibility of recruiting design graduates with meaningful drawing skills is becoming increasingly rare. Curiously, these issues have garnered little attention from the very academics that develop the learning experiences that designers will engage in during their journey through higher education.

The content of this paper is based upon doctoral research conducted over the past year. The methodology includes a review of current and historical literature relevant to the nature and purpose of design sketching and the cognitive processes it supports. Observation and teaching practice within several higher education environments together with semi-structured interviews with educators, industry experts and students of various design disciplines have been employed at this albeit initial stage of the project.
It seems to start with the student’s understanding of, and relationship with research. Bruce Archer’s seminal paper published back in 1995, (Archer, 1995), conveys the importance of practice-based research for the designer, but somehow this still eludes so many students of the disciplines. At ground level, students’ understanding of what research actually is appears desperately limited. During tutorials, they readily convey their belief that research for design is spent trawling what they perceive as the dry stacks and journal databases of their university library – that or Google will supply all the answers.

Based on my own observations and those of colleagues, Google is where most visual research is initially tapped into, often comprising collections of pictures stuck into a sketch book with little or no analysis. Students are increasingly demonstrating a lack of awareness of and appreciation for the richness and value of practice-based research; the hours spent sketching, drawing, model-making and prototyping that underpin their developmental thinking and decision-making processes towards a final solution. They tell me this is not proper research: they believe research can’t possibly be a creative or enjoyable process. The sketching of ideas is becoming an increasingly rare sight in many university design studios. The most personal, immediate and reflective of tools available to the designer is the very one that appears to be struggling for existence.

Akin & Akin’s research, (1996), into the design problem-solving process suggests that in order to create new concepts the designer’s frame of reference needs to be broken. Shifts in mode between drawing, examining and thinking enable design discoveries to be made and the gathering of information, drawing and reflection in combination with quick switches between these activities are deemed to be vital to successful progress during design development. So why is this often such a problem for students?

**Why designers don’t sketch**

Pamela Schenk is one of only a tiny handful of educators who has voiced concerns over many years about the demise of the use and importance of sketching in design higher education. She suggests that secondary education fails to equip prospective students with drawing skills required for their studies and that consequently, industry’s needs are not being met by the drawing skills of graduating designers. She has observed the standards of drawing among newly graduated and early career designers dropping over the past few decades and as a result, impeding the activities of commercial design studios, (2005a). Misconceptions among students about the purpose and nature of sketching appear to affect their relationship with it, and could suggest an issue within higher education at a fundamental level. This, from an interior design course leader:

> It’s their perception of what is a good sketch…they think it has to be the most amazing Leonardo da Vinci-type sketch, instead of a working idea, a methodology to discuss your ideas from your head, and it doesn’t have to be perfect, (Fitton, 2016).

Interviews with educators suggest a generalised mystique around sketching, for example:

> People are terrified that it’s a very personal activity and I think there’s a lot of mythology around the ability, where that ability comes from, you know is it a learnable skill or is it a dark craft? (McNicoll, 2016).
Changes in society have also affected the attitudes of individuals towards any relationship they may have with sketching, with technology replacing the manual processes that previously existed. McNicoll states,

*People don’t necessarily use the word ‘draw,’ or what we would think of as drawing activity any more in their lives,* (McNicoll, 2016),

and this is having wider effect on industry, one design director complaining,

*Over the last 15 years... reliance (is) on software to provide the answers rather than a deep thinking process,* (Mawford, 2016).

Issues affecting design undergraduates as they engage with their higher education experience act as a barometer of attitudes affecting wider society, including the belief that digital products are more attractive than anything manual. Instant gratification has become an intrinsic part of our existence and immediacy of results has become deeply embedded within our culture. This and the constantly media-driven belief that success happens without effort may be affecting the potential relationships of students with the idea of sketching, with lecturers bemoaning their students’ attitudes:

*A lot of people sort of say, “oh, I’d love to be able to sketch,” and I say, “well, you can if you try hard enough,” but there seems to be an unwillingness to spend the time sketching,* (Mawford, 2016).

There is definite acknowledgement of sketch inhibition within higher education often manifesting in avoidance behaviour as observed by Fitton:

*If it’s a session with an activity, they just pretend they’re doing it, don’t do it, or do just a part of it...sometimes they stop coming to their sessions.*

Additionally students, *“will go to the extent of not having produced any sketching and not coming into tutorials because they’re embarrassed because they haven’t got the work...then they present their sketchbooks and we can have students who have as few as four pages of drawings,* (Fitton, 2016).

Booth, Taborda, Ramani, & Reid, (2016), identify several types of sketch inhibition during the design process and these fall into three distinct areas. Firstly, the issues of the individual, including intellectual inhibition, or a lack of awareness of the relevance of sketching to the design process. Skill-set inhibition; the lack of expertise needed to actually use sketching to an effective level. Personal inhibition; the ego-driven issues of perfectionism that impair the creative flow, and situational inhibition, when a designer does not feel in the right state of mind to sketch, i.e., not in the zone. Secondly, social issues are observed to create inhibition towards sketching. These include social and comparative inhibition, or the fear of being judged unfavourably by others during the process of creating sketch material. Social loafing applies to situations including sketch generation and involves a lack of input in a group situation, either through fear of judgement or laziness. The third area is that of technological inhibition caused by a prevalence of digital tools available in the designer’s environment which then leads to a disinterest in manual sketching. All of these types of inhibition are evident among students during design-based activities within the studio.
Inhibition based on fear of failure is also identified by Leblanc, (2015), suggesting this has resulted in a common belief that experimentation and failure, which are a normal part of the design process, are unacceptable. Because of this fear, students rush into visualisation as soon as they have the mere suggestion of a concept. This results in omitting stages of evaluation and refinement that are essential for a fully developed design, demonstrating that, “the development process is widely misunderstood or inaccessible,” (p2).

Leblanc’s, (2015), research with industrial design students at Montreal University elaborates on the wider issues of sketch inhibition within higher education. She says,

*We continually observe students struggle with the creative process, especially with sketching, exploring and developing ideas into mature designs. Many see sketching only as a means of visualization and rarely know how to use it as a creative thinking tool (p.1).*

Student attitudes are important to the management of their own sketch inhibition; Leblanc observing that,

*Those with high ambitions and strong self-motivation manage to overcome the deficit; others learn to mask their lack of skills in one area by developing others (p.2).*

Belief that the computer will do one’s creating, eradicating the need for paper and pen anywhere in the design process could be dangerous and the fear among design students to put pen to paper is a concerning trend. Ironically, industry requirements for graduates who can draw is increasing, (Mawford, 2016). To be able to sit with a client and sketch out loose, nebulous ideas at the briefing stage of a project is a USP that many designers need when entering the job market. Indeed, there are companies that require recruits to demonstrate a portfolio of drawn work above anything created using digital methods. However, many students within higher education are under the impression that, as has been the case for the past twenty five years or so, their future success lies more in their ability to use a piece of software to a reasonable standard.

Leblanc, (2015), acknowledges the value of digital tools, but laments their ubiquity in design education,

*Students are judged by their skills with these tools rather than their creativity or problem-solving ability. This unfortunately nurtures the misconception of design as an aesthetic gesture rather than an intellectual, creative thought process that helps solve problems and drive innovation (p.5).*

The essential processes of design embodied by its practical activities have been replaced with what she perceives as, “more gratifying digital tools,” (p.2).

One of several problems appears to be the belief among undergraduate designers that the presentation visual is the design — the shiny surfaces and organic shapes that software can offer, accurately positioned and beautifully lit, are testament to both the developer, and to their user. A few sessions of instruction can produce passable images that look enticing to the lay person and fulfil the student’s need for progress. The same few sessions’ instruction cannot develop creative thinking, evaluation, self-awareness and an
understanding of how ideas grow into solutions that answer the needs of the user. This takes much longer – and it is where even educators appear to get confused. They sometimes mistake the teaching of thinking with the teaching of visualisation: but, remember, the D in CAD stands for Draughting, not Design. Institutions invest many thousands on systems and software to produce the discipline-specific types of visualisation and manufacturing drawings that the designer needs to produce. They often do this at the expense of teaching the conceptual tools that designers need to generate and develop design thinking. This is supported by Stacey, (2016), who suggests that result, as opposed to process-oriented assessment of pupils’ work in primary and secondary education leads ultimately to a fear-based mentality among students within higher education who are afraid to experiment in case of failure. Fitton also bemoans the system within schools:

They spend so long at school working through a process to get to the final element… and the whole emphasis and the grades are based on the end product. Because there is no weighting… given to the process and the quality of the sketching (Fitton, 2016).

This lack of ideas is clearly apparent in the way that designers increasingly choose to work. Fine artists create mess. Their thinking and research surrounds them and is always a tangible part of their activity. A fine artist’s studio is not a tidy space. It is full of research in the form of materials, sketches, found objects and continual experimentation. It is where 2 and 3 dimensions meet in an individualistic, glorious amalgam of creativity. Without their space, artists cannot create. Design students still have the option of studio space to experiment with their ideas, to make mess, to create, refine and develop their thoughts, but an increasing number of them prefer the paperless approach – when you start with no sketchbook and have no ideas, the only place to go is the CAD lab. It’s a safe place to hide – it’s where you can create something that looks convincing, (as long as you can use enough of the functions).

The shame of this situation is that students should be working the other way round. They should be bursting with ideas and seeds of inspiration – generating concept sketches, models, prototypes, colour palettes, and then asking, ‘What should I use to develop my ideas?’

The benefits of computers to design are not in question – they handle with ease things that the mere mortal struggles with: speed of processing and the ability to store and manipulate vast quantities of data at the click of a mouse are their gift to designers. They would otherwise struggle to animate a walkthrough of a building concept before it’s even built, lay out components, revise concepts, and cost-effectively amend manufacturing drawings. However, computers do not handle well the vagueness and interpretative opportunities that sketching offers.

The benefits of sketching
Sketching is not a singular, homogenous activity – it is made of many smaller processes with their own distinct purpose and benefit to the design process. It also serves more than a singular purpose. However, even those who engage with it struggle to identify the many functions it fulfils.
Ferguson, (1992), offers an early taxonomy for sketching, including the, “thinking sketch”, referring to Leonardo’s sketches and those of contemporary engineers as a tool for visual thinking, the, “prescriptive sketch,” used for specification of a final solution and the, “talking sketch,” (p96-97), used to communicate with others during the design process.

Pei, Campbell & Evans, (2011), offer a more developed and hierarchical taxonomy involving sketches, models, drawings and prototypes. Personal, shared, persuasive and handover sketches are further classified. They deconstruct personal sketches into idea sketches, study sketches, referential sketches and memory sketches. The idea sketch is to, “allow the developer to externalise his thoughts quickly,” (p12), and is most relevant to this research, as is the study sketch which investigates scale, structure and layout based on the initial idea sketch.

Gabriela Goldschmidt’s extensive and widely cited work has proven one of the most critical contributions to the theory of design sketching for this research. She presents experiments conducted at MIT, (1989), where she reiterates her earlier observations of, “moves,” and, “arguments,” as two distinct types of reasoning embodied by sketching: the, “move,” being a tangible proposition within the process, and the, “argument,” (p35-6), being a conceptual micro-activity on the part of the designer within that process; that of the individual thought.

Goldschmidt classifies sketch activity into three distinct areas:

Moves made while actively sketching, moves made while contemplating sketches and reading off them and moves with no graphic input (1989, p.127).

She proposes that sketching can be a representation of either linear or diverse thought, acts as a means to test and develop ideas and ends once the hard-line activity, e.g.; draughting, takes place. She coins the term, ‘interactive Imagery’, the process of imaging, sketching and resketching images until useful information can be extracted from them:

Sketching is not merely an act of representation of a preformulated image...it is more often than not, a search for such an image (1989, p.131).

On the purpose of sketch function during the design process, she devises a, “seeing as,” and, “seeing that,” (p131), structure. “Seeing as,” utilises a Gestalt approach during sketch thinking, using the mind’s eye to develop ideas. “Seeing that,” relates to the entity being designed and applying a non-figural approach to considering it - using the tangible output of the sketch process as a platform for further thinking.

Goldschmidt further anatomises sketch activities within the creative process, (1992), referring to leaps, or sudden insights within the mind of the designer “one in which the distance in time or place among relevant moves is too great to track,” (p200). Serial processes are identified where sketches are produced one after another, but not necessarily relying on sequential thought within a linear process and sequential sketch activity that is likened to machine processes where a set of information is developed based upon the previous set of information.

She considers the economy of sketching, (2003), where no cognitive energy is used in converting marks into readable information – marks on the page just are. Access to the
history of the creative process is also made possible through sketching being, by default, serial information whereby complete sets of developmental information can easily be kept. Her work also observes the importance of expertise for the effective handling of the sketching process: novices often find themselves unable to detach from an image they have created that they are unhappy with, thus forming a negative development within the process. This is less the case with more experienced designers who have a broader range of experiences to draw upon, (1992).

On the development of digital tools to replace traditional sketching methods, she argues,

*Persistent attempts to replace sketching with algorithmic, computational techniques, (largely computer-based), have so far failed to contribute to design reasoning in any way...the cause lies not in insufficient development of these new methods but in the inherent potency of the sketching tool* (1992, p. 215).

And although over twenty five years old, this statement is still relevant to the intrinsic ability of sketching to support the designer’s creative and cognitive processes.

Goel’s, (1995), work on the nature of ill-structured problems addressed by designers considers the inadequacy of cognitive science and its reliance on structured symbolism to address the complexities of language used by designers during the early stages of the design process. His experiments with graphic designers observe that freehand sketches convey dense ambiguous information which offers the designer new possibilities for interpretation – something that a digital alternative struggles to replicate. He also presents a coding system for sketches based on his experiments: lateral transformations occurring within a solution space during the creative shift to alternative concepts:

...*when a new idea is generated, a number of variations of it quickly follow. The variations expand on the problem space...One actually gets the sense that the exploration and transformation of ideas is happening on the paper in front of one’s eyes as the subject moves from sketch to sketch* (p.200).

By contrast, and similar to Goldschmidt’s concept, vertical transformations occur during the sequential development of a concept towards a solution. Goel also identifies reinterpretation as a vital function of sketches, allowing the observer to apply new meaning to an existing set of information – a vital part of the designer’s activity during the early stages of design.

Donald Schon considers problem-solving activities across multiple disciplines including design for which the importance of sketching is emphasised. Designers are involved in a, ‘transactional,’ relationship with the design and are in a “reflective conversation with the situation,” (1991, p4), for which,

...*the act of drawing can be rapid and spontaneous, but the residual traces are stable...the graphic world of the sketchpad is the medium of reflection-in-action* (1983, p.153).

Design situations involve material situations and analysis though sensory appreciation. Schon, (1991), proposes that the designer constructs a conceptual world comprising objects and their relationships through which he addresses the design problem. A design
world is personal to the designer – it is created according to his perceptions. He believes the more innovative a design episode, the more likely it is to be unique to the designer: ‘The designer designs not only with the mind, but with the body and the senses,’ (p7). Similar to Goldschmidt’s proposition of Seeing As and Seeing That, he refers to the process of ‘Seeing-drawing-seeing…a designer sees, moves and sees again,’ (p7). His notion of seeing embraces the use of faculties other than sight; his terms, “recognise, detect, discover and appreciate,” (p7), are proposed to reinforce the concept of design being a bodily and sensory process.

Schon and Wiggins, (1992), consider experience as being vital to effective problem-solving. The more experienced a designer, the more domains he can work in at once; the designer’s move to address a single term being effective in many domains at once. A lack of experience and its effects on working memory limitations is also noted; addressing a single domain can overcome the issues of such limitations, especially in a less experienced designer where the act of seeing-moving-seeing assists in the management of complexity in a design problem. George Miller’s infamous paper, ‘The Magical Number Seven,’ (1956), proposes that the human memory can only process seven pieces of information at one time. It is clear that the short term memory utilised by the designer can only handle a relatively small number of issues at once, thereby demonstrating the need for recording the process of design thinking in order to effectively manage and avoid loss of data.

Bilda and Gero, (2005), also identify issues of working memory limitation among non-sketchers and the ability of sketching to offload it. Bilda, Gero and Purcell’s, (2006), protocol analysis experiments establish the importance of sketching during design development: it imparts a dialogue whereby visual messages from the page constantly flow back into the mind. They noted that sketches enable the ability to see the developing concept in both whole and partial form,

...seeing it in parts and seeing it as a whole...the whole emerges from and cannot exist without the parts but depends on the relationship between the parts, (p.12).

Re-representation is identified, enabling the designer to detect new elements that could be developed further:

Half the process is drawing it, and drawing it....and eventually...something sort of creeps out at you, (ibid).

Externalisation of mental imagery is noted, supporting the benefit of offloading working memory. Sketches also form a language of immediacy and intuition, “...as you think you speak...If you think first and then speak, it would all come out differently,’ (Bilda et al., 2006, p.12).

The themes of Fish & Scrivener’s eminent paper (1990), are still valid, especially those relating to the cognitive aspects of visual imagery. They discuss the indeterminacy of manual sketching that enables perception of more than one option at once, comparing this process to that of the computer where the designer can be forced down the route of developmental detail too early, potentially harming the design process. They also lament the inability of the computer to offer the same serendipity of manual sketching and consider the difference between descriptive and depictive information and the function of
sketches in the relationship between them. The language they use enables the designer to create their own mental images based upon what they see on the page; marks seen on the page may influence the image within the designer’s mind. This ambiguity can initiate recognition and further mental imagery – essential tools for the successful designer.

**Education issues**

The symptoms of sketch inhibition evident to educators, (including avoidance, non-attendance, losing work, and minimal design development), are not insurmountable, and by taking an analytical approach to current practice in HE, the following considerations are offered:

Sketching for design is not the same as sketching for fine art practice: it is not an artefact-centric activity but one of process, supporting the cognitive activities engaged in by the designer. Schenk alludes to the teaching of drawing specifically within design education, that it is often inconsistent with the needs of designers and based on fine art practice and as opposed to developing a visual syntax to enhance the mental processes required by the designer, (2005a). Friction also appears to exist between the disciplines of fine art and design drawing which serve different purposes for the designer; those of observation and conceptualisation respectively, (2005b).

Students’ belief that they should excel at fine art drawing in order to feel comfortable using sketch methods for design is a common but erroneous assumption and institutions often unwittingly promote this notion. Schenk, (2005b), observed that many drawing tutors are borrowed from a fine art environment to teach observation-based skills that fulfil only part of the needs of the design student rather than developing pedagogy for sketching and drawing that is design-specific. Institutions could be offering, as Schenk believes, teaching contextualised within the specific language of the design discipline being studied.

Management of sketch inhibition using drawing tools has been addressed by Hu, Booth and Reid (2015), who consider how art-based warm-up exercises among students affect their cognitive states during concept development. They gave a group of engineering students geometric sketching exercises, art-based sketching exercises and as a control, no warm-up exercises prior to a simple design task. They concluded that art-based warm-up exercises were helpful in concept generation; the art-based approach appeared to benefit younger participants most, and unexpectedly, female participants expressed an increase in pride in their sketch output after the exercises. This suggests that management of sketch inhibition through simple studio-based activity is indeed possible and shows further potential for this research.

According to Lambert and Firth (2006), the growth in numbers of design courses over the past twenty years has created more places than students and consequently, less competition for those places. They state that,

> Applicants no longer have to compete against each other, and consequently students’ drawing skills upon embarking on a design degree are generally much less adept than in the 1980s (p.5).
Within such HE design courses issues exist regarding the understanding of differences between designing and visualisation. Stones and Cassidy refer to Black’s (1990) earlier research confirming that:

Students judged their work using a different set of criteria when designing with the computer and that a finished appearance forms part of that judgement, as if the students were mistaking a high level of finish with design proficiency, (Stones & Cassidy, 2010, p.442).

Educators can also become victims of the persuasion techniques that digital rendering can offer, and situations have occurred when a student with poor design skills has achieved a higher mark for work presented using CAD, rather than the student who has engaged in the design process more fully, but using less persuasive visual methods.

Engendering student understanding of the importance of practice-based research, and the position of sketching during design concept development is fundamental. Only by reinforcing the importance of “research through practitioner action,” (Archer, 1995), alongside what is considered traditional research, will student designers come to understand that their hands-on activities during the design process are valuable pieces of research in their own right. Accordingly, sketching as the language to record and analyse such activity is crucial within this process.

Flawed assumptions evident in design HE include the belief that students automatically know how to design. Leblanc (2015) suggests that, “Students use sketching to visualise ideas, yet many do not know how to use it as a thinking tool.” Some simply do not know what to do with ideas, or often, how to generate them in the first instance. An observed example of post graduate fashion students has demonstrated a desperate willingness to learn together with huge motivation, but no design skills of note. They don’t draw, never have and have to begin developing a relationship with their thought processes before they can hope to become creative designers. Many refer to their collections of images from the internet - from then on, they are lost, and this is where sketching could clearly support them.

Students appear to believe that the computer will do their thinking rather than having to engage in what they often perceive as the long-winded and dull exercise of sketching. They do not understand the difference in language between the two systems. They are unaware of the immediacy of sketch mark-making versus the function-based process of making prescribed marks on a screen, the inability of the screen to offer the levels of representation of the manual sketch and the lateral and vertical processes that are neglected by working on a single interface as opposed to a wide and endless substrate.

A clearer delineation between the skills of designing and visualisation could also benefit students to understand and develop a healthier relationship with their use of digital tools particularly among those who struggle with their ideas. Coyne, Park, & Wiszniewski, consider inexperience as a cause for misunderstanding:

*If you only know how to draw a box, your building will be a box, and if you know how to design anything on the computer you can design anything,* (2002, p. 270).
Appreciation that an image of a design is not the design itself, but an interpretation of the micro and macro elements at a single point in time is important, rather like a photographic snapshot of a family: it is a useful record but tells us nothing about the nature or dynamics of the family in a real life situation.

Goldschmidt’s (2003) observations on the value of expertise should be acknowledged to ensure the designer’s relationship with sketching will be sustainable. Spending a few hours a week for a single year learning a new language is not enough to gain expertise in it; it has to be sustained and supported by constant study – this also applies to the visual language of sketching, so why is it treated so differently?

Attitude of the student is vital to their ability to engage with sketching as a language for creative development. As Leblanc (2015) states, those students willing to invest the effort into developing their skills can conquer their issues of inhibition – others will fall by the wayside. Students, through no fault of their own, are generally unable to elaborate on the benefits that sketching brings to design; the cognitive processes it supports and the symbiotic relationship between sketching and idea development. They need to have basic anatomy and physiology of sketching before they can even begin to engage with it in a meaningful and sustainable way. Leading the student to water is the easy part, but as any journey through educational proves, the desire of the individual to learn is essential.

Curiously, the five-year-old congratulated for his naïve mark-making will no doubt become the nineteen-year-old too fearful to record any kind of thought through sketching. And there lies the paradox: that something so intuitive and natural can mutate into something that terrifies intelligent adults. Lambert & Firth, (2006), observe that,

...students are entering design courses with less skill (so) we should be weighting more of our teaching time towards drawing than ever before at undergraduate level, as well as in secondary schools and sixth form colleges (p.6).

Even if the secondary education system and other more complex social issues, (Booth et al., 2016), are complicit in this, with just a little practice the confidence of sketch inhibited individuals can grow rapidly. An example being a recent student of mine who spends time with her eyes closed during studio sessions, creating mental images then sketching them, regardless of how they appear on paper: her design ability and confidence have grown in just a few weeks.

Lastly, and possibly most controversially, questioning the trend for a problem-based approach to learning and considering the dirty word of apprenticeship or a shift toward classical approaches to the teaching and learning of new skills. Fitton, suggests that,

We’re all a bit timid about pushing students to do things that they don’t want to do, and I think you have to (Fitton, 2016).

Before the student can develop their own vocabulary they need structure, a toolkit of methods which they can then refine and develop, experiment with or leave behind if they so choose – but at least they have the choice, rather than deferring their creativity from an analogue to a digital process with no understanding of the differences between the two worlds.
Conclusion
The purpose of this paper is not to romanticise pre-digital practices or malign vital digital tools: it is to encourage debate about the importance of sketching, to identify the functions that it alone can provide for the designer and suggest ways that the concerns of industry, educators and students alike can be addressed. Reconsidering sketching not as an outdated practice to be replaced or avoided, but as a cognitively essential process to drive creativity, and consciously imbuing it within higher education can only be healthy. Empowering students with the confidence to handle the indeterminacies, intolerances and vagaries of the design process that only sketching can embody, rather than to cling onto a simplistic, linear approach can never be a bad thing. In doing this, as educators, we can help empower design graduates with greater creativity, inspiration and ambition when embarking on their careers – something which will ultimately prove beneficial to everyone.

References
Fitton, R, (2016), Head of Interior Design, De Montfort University, Leicester, UK, Interview


Mawford, J. (2016). Director Z-Solutions, Suffolk, UK, *Interview*


About the Authors

Lisa Thurlow is a designer, lecturer, PhD researcher and Senior Fellow of the Higher Education Academy. Her interests lie in the relationship between design education and industry and the development of pedagogies for design education.

Peter Ford is Professor of Design and Head of the Design Unit at De Montfort University. He specialises in new product design research and development and promoting the role of design in industry.
This page is intentionally left blank.
Exploring Future of Graduate Design Education

SINGH Sapna

The Ohio State University, USA
singh.183@osu.edu

Design is in a state of dynamic change. As design undergoes change, design education is expected to adjust as well, but to a great extent its future is uncertain. Future scenarios exploring the role of design and designers in society can help envision the design education that could evolve from those scenarios. This paper presents future scenarios for design education that were based on a research study conducted as a Masters thesis. It presents the methodology adopted for developing future scenarios that combined design research and concepts applied in developing organizational strategy. The paper discusses the findings of the research leading to identification of key themes that will influence the future of graduate design education. Four future scenarios were identified that were translated into future roles for designers: traditional designer, constructive design researcher, hybrid co-designer, and systems sense maker. These future roles will have wide ranging implications for design schools and selection of a direction to pursue would need assessing what would be a good fit taking into account available resources and ability to build competencies.

keywords: graduate design education; future of design education; future scenarios; scenario development

Introduction

Design, once an art focused on the shape of things, is now an art and a science. There is a decisive shift leading to transformation from thinking of design as a craft-based artisan skill of designing things to thinking of design across a spectrum of target fields. (Friedman, Lou, & Ma, 2015).
Design is becoming a real force in the world. Nowadays, design-trained people have gained access to a very broad range of professions, and together they wield enormous influence from positions in senior management, government, and academia (Dorst, 2015). Although definition and the sphere of design influence have changed, design education has remained rooted in the craft skills. Design education has two trains of thought: the foundation and the progression. The foundation skills of observation and application have remained consistent through the history of design but the progression of design is in constant change (Foster O., 2015 as cited by Currey, 2015). “If design is to live up to its promise it must create new, enduring curricula for design education that merge science and technology, art and business, and indeed, all the knowledge of the university” (Norman & Klemmer, 2014). What is that promise that design has to offer? How can design schools lay the foundation to deliver that promise? How can or should design education prepare future designers for this expanding sphere of design influence?

This paper presents the research study that was conducted to explore / seek answers to these questions. Findings from the research study led to development of future scenarios and roles for designers. The research study and its outcomes were part of a Master’s Thesis completed by the author in May 2016. The study focused on the future in next 15 years, i.e. year 2031. The entire thesis can be accessed via the OhioLink Electronic Theses and Dissertation website at: http://rave.ohiolink.edu/etdc/view?acc_num=osu1461202275

**Focus and objectives (problem statement)**
The research study started with investigating the broad landscape of design education. The focus on graduate design education was developed after secondary research and conversations with diverse stakeholders that included faculty, students, alumni and design industry professionals. Initial investigations indicated that graduate design education faces challenges from emerging graduate level programs in business and innovation based on design thinking and has a weak competitive position due to lack of awareness among organizations regarding the value of a graduate education in design. Industry professionals indicated that the educational qualifications of a graduate student did not matter as much as their portfolio of work experience. Additionally, the design schools have not effectively communicated the value of their graduate programs. The research question was reframed to “**What is a future of graduate design education that delivers high value?**” (Singh, 2016).
Methodology

The research methodology combined two approaches to human-centered design research: information-based and inspiration-based.

Information-based research borrows from the scientific model of research, is built upon the results of investigation, analysis and planning, relies primarily on extrapolation from past events as a way to move into the future. (Sanders E. B.-N., 2005)

Inspiration-based research tends to be explored and applied by designers. It is built through experimentation, ambiguity and surprise, and draws primarily from the future and the unknown, using imagination as the basis for expression. (Sanders E. B.-N., 2005)

For this research the information-based approach focused on understanding the current state of graduate design through a survey and semi-structured interviews. The inspiration-based approach focused on exploring the future of graduate design through a participatory design activity using a generative design toolkit. (Sanders & Stappers, 2012)

In addition to the primary research, extensive secondary research was conducted to understand the past and current state of graduate design education through review of current graduate design programs and identify possibilities for the future. Literature review revealed several resources that can help understand the past and present of design education but not enough exploring the future. Most of the literature focused on undergraduate design education only or design education overall.

Findings from the research led to identification of influencing factors and trends as well as emerging themes for the future of design and design education that formed the basis for developing future scenarios. The future scenarios were developed using techniques for building scenarios described by Peter Schwartz in his book “The Art of the Long View”. The futuring technique, referred by many as the “STEEP” model, takes into account the social, technological, economic, environmental and political factors that drive change. Future scenarios were translated into future roles for designers. The future scenarios and roles formed the basis for exploring a framework for the future of graduate design education.
Current state of graduate design education

Findings of the secondary research highlighted that in the United States (U.S.) graduate design education is young and evolving. Most of the masters programs were developed mostly in 1970s.

Graduate design programs are mostly masters level programs, which is considered as the terminal degree in the U.S. There are only a handful of doctoral programs. A Masters is the required degree for academic positions and the Ph.D. is a desirable qualifications at some universities / design schools. Design related positions in the industry rarely require a graduate degree in design. A review of 50 postings for jobs sought by graduate design students showed that only 10 required a graduate degree. Three out of the ten specifically required a graduate degree in design whereas five positions required a graduate degree in design as one of the disciplines. Interestingly several of the job descriptions mentioned that design thinking would be a desired skill. Observations indicate that there is high value for design and design knowledge in these organizations but it does not necessarily mean higher value for design education. (Singh, 2016).

The early masters programs offered opportunities for designers to pursue advanced studies in industrial design, visual communication and space design. There are several masters programs that continue to offer these specializations. But in the recent years, especially last 8-10 years, there has been a growth of graduate design programs not just at design schools / universities but also at business and technology schools. Many of these programs are geared towards an interdisciplinary and transdisciplinary curriculum bringing together students, faculty and other stakeholders from diverse disciplines. These programs are focused on developing a broad set of skills and knowledge with the core specialized knowledge and skills in ‘Integrated Design’. For example, Masters in Integrated Innovation at Carnegie Mellon University, Master of Integrated Design and Management at Massachusetts Institute of Technology (MIT). Many of these programs give students the opportunity to collaborate on real world projects that take on social issues and systems based complex and/or wicked problems. The length of these programs range from 1 to 3 years. The curricula are either project based or research focused. There is no common framework for graduate design education that guides these programs. Graduate design education is in a state of dynamic change driven by exploration of new design domains as well as transdisciplinary approaches in human-centered design. (Singh, 2016).

Design education is occurring not only within educational institutions but also outside through alternative models. Design thinking is slowly and gradually becoming part of corporate culture. Organizations are acquiring design agencies to integrate the design thinking and process into all aspects of the organizational processes. Formal and informal learning channels are being developed at these organizations teaching design thinking and methodologies to entire business units in a company or individuals with non-design backgrounds interested in adding design knowledge and skills to their portfolio or for designers interested in updating their design skills. Examples of such organizations are IBM, Capital One, McKinsey & Company, Accenture, etc. For those who are seeking design education but not interested in investing one to three years, there are alternatives such as the Austin Center for Design in Austin, Texas that offers 10- days to a year-long certification programs. An example of another model is the 30 Weeks program, an
experimental design school started in September 2014, backed by Google, Pratt Institute, Parsons New School of Design, School of Visual Arts, the Cooper Union and the education company Hyper Island. It is a founders program that transforms designers into founders who are equipped with the entrepreneurial skills, knowledge and tech know-how to create products and start impactful companies. (www.30weeks.com, 2014). The program for 30 Weeks is kind of like a cross between a traditional school and a startup incubator. The program operates out of a co-working space in Brooklyn. These examples indicate that design thinking is rapidly gaining a place in the corporate world as one of the desirable qualifications for our industry leaders. It is being cited as — the approach to creating and building new business ventures. (Dodd, 2014).

**Primary research data analysis**
Data gathered from the information and inspiration based approaches was qualitative and “messy”. Data was sorted in an Excel spreadsheet and analyzed using methods appropriate to the characteristics of the data. Statistical analysis was conducted for the numerical data from the survey. Responses to the open-ended survey questions were summarized into themes and dominant themes across stakeholders were identified.

Responses from the semi-structured interviews were sorted in an Excel spreadsheet by breaking down into small chunks of content. Each chunk of content was summarized into a short descriptive phrase. The phrases/statements were assigned a category code such as “curriculum” “definition of design” based on what was considered as the focus of the phrase or statement. After assigning categories, all the phrases for one category were copied into one Excel sheet and sorted by stakeholder groups (Student, Alumni, Faculty and Industry). Themes were identified from the patterns observed for the categories.

Data from the participatory design activity were sorted into three types of information: definition or description of design, visualization and the presentation of visualizations. Qualitative analysis of this data was conducted to identify key themes. The design definition / descriptions was each categorized into themes. The visualizations were analyzed individually as well as collectively. For collective analysis, the most frequently used images and words across the visualizations were identified, they were ranked based on frequency and the meaning(s) associated with each was recorded. This helped to identify the key ideas expressed across the visualizations. For individual analysis, key ideas for each visualization and theme of the definition for design by participants was identified, key ideas were sorted into categories and themes for categories from the ideas were identified. Key themes emerged for each category from all visualizations.

**Research Findings**
The research study had a total of 56 participants across all three activities (survey, interview and participatory design activity). Out of the 56 participants, 21 were students, 12 were alumni, 20 were faculty members and 3 were industry members. 45 people took the survey, 37 people participated in the interview and 24 people participated in the participatory design activity.

Participants were invited from various design institutions and organizations around the United States. The research participants represent the following ten institutions: The Ohio
Findings from survey
The survey included questions that asked participants to rate the significance of factors towards assessing value for graduate design program. The factors were categorized as curriculum, learning experiences, student demographics and faculty. The observations from the analysis of data gathered through the survey showed that the two factors that received the highest overall rating were “emerging design disciplines” and “faculty research interests” while the factor that received the lowest overall rating was “all or most students in the graduate program come from a design background”.

The open-ended questions focused on understanding the strengths of current graduate design programs and suggestions for changes to the programs. The top three strengths of current programs that emerged from the responses were flexibility of the program structure, faculty research and expertise and program reputation among design industry and academic institutions. (Singh, 2016) Flexibility of program structure refers to ability to choose research interests and thesis project topics. This type of program structure encourages multidisciplinary and interdisciplinary research. Students can enrol in courses based on their research interests and develop a personalized curriculum. Among the responses for the changes to current programs, the top most suggestions were developing flexible curricula and programs, increase opportunities for real-world collaboration working with external organizations, encourage collaboration between faculty and students and develop multidisciplinary curricula. Real-world collaboration refers to introducing opportunities to collaborate with organizations on real-world projects. Most of the students pursuing a graduate degree in design are looking to advance their career opportunities, explore emerging design domains and/or pursue academic careers. To achieve these objectives, programs need to provide a structure that support the growth of
the students as well as the faculty research interests and discover avenues to make real-world impact.

Key themes that emerged from the survey data were:

1. Graduate design education should be research and practice focused.
2. Faculty, students and alumni show higher preference for emerging design disciplines.
3. Real world experience should be integrated in curricula.
4. Curricula should be multidisciplinary.
5. Multidisciplinary community of students offers exposure to diverse perspectives.
6. Faculty research interests and expertise draw students to the program.
7. Curriculum should help develop advance design skills.
8. Program structure should be flexible and exploratory.

Findings from interviews
A total of 37 participants took part in the interview sessions. Out of the 37, 13 were faculty, 10 were alumni, 10 were students and 4 were members of the industry. All interviews were held as individual sessions.

The method applied for the analysis of data from interviews was based on grounded theory. The interviews had a guiding set of questions to dig into the past and current experiences of the participants and to understand their aspirations for the future. Questions were revised and added through the research study and distinct themes were identified during the interview conversations. This approach did not allow for sorting and analysing data based on questions. It required analysis of the responses of the participants to identify patterns. The grounded theory analysis was considered appropriate.

Participants’ responses belonged to a range of topics related to graduate design education including curriculum, future of design practice, collaboration between design education and industry, and changes in design education. The summary phrases developed from the interview data were assigned to one or more of the following category codes: curriculum, program structure, future of design, definitions of design, design schools, design industry, core skills, transdisciplinary, advance skills, change in design education, design value, issues in design, master degree, multi-disciplinary, PhD in design, real world experience, traditional design, undergraduate design education, complex problems, faculty, practice focus, students and design thinking.

The following key themes were identified from the interview data:

- Design is transdisciplinary: It referred to integration of multiple disciplines into graduate courses and research. The participants emphasized that design problems are becoming complex and system based issues. Such problems needed solutions derived from the knowledge and skills derived from multiple disciplines.
- Structure for exploration: The structure of graduate programs should guide and facilitate exploration. Graduate education tend to be either open-ended or have less structure. Many students face the challenge of developing their own course plan, which can be a daunting and confusing task if there is not much information and/or guidance. Participants, especially students and alumni, expressed the need
for a structure that offered flexibility to develop a personalized course plan but helped guide their choice of courses.

- **Focus on advance skills**: Graduate curriculum should focus on developing advance skills such as design research, systems thinking, insight translation and synthesis and encourage thought leadership.

- **Collaborative learning**: Graduate programs should facilitate collaboration between faculty and students, students from multiple disciplines, design schools and industry, designers and non-designers. Designers are no longer considered as the lone creative geniuses. They are expected to work collaboratively and co-create solutions with other designers as well as non-designers. The foundation for working collaboratively should be laid during their tenure as design students.

- **Research based and practice focus in curriculum**: Graduate programs should offer more opportunities to gain real world experiences and collaboration with industry. The research participants emphasized the importance of integrating real world projects in the graduate design curriculum by collaborating with companies, non-profit and government organizations.

**Findings from participatory design activity**
Twenty-four participants took part in the participatory design activity. They worked individually or in groups to create 17 collages visualizing future of graduate design education. Figure 3 shows one of the collages.

![Collage created by one of the participants of the participatory design activity (Singh, 2016)](image_url)
The definitions of design by the participants indicated four distinct themes: design is *problem solving, sense making, making artefacts* and *creating experiences*. Out of the 27 definitions written and drawn by the 24 participants, the most dominant themes were that design is a *problem solving* process and that design is a methodology for *sense making* for resolving complex problems.

Among all the images included in the toolkit, the image titled “team discussion” (shown in Figure 4) was used most frequently. It was used in 9 out of 17 collages. The image was primarily used to represent multidisciplinary collaborative teams. Participants also used the image to express that design in the future will tackle complex problems that would require transdisciplinary collaboration among people with common goals but different knowledge and expertise. The second most frequently used images were titled “create value” and “smiling faces” and are shown in Figure 5. Participants used the “create value” image to express that design creates value and design will make a much larger impact in the future. Participants used the “smiling faces” to express two key ideas, one that design is human-centered and creates positive impact on people’s lives and second that design will need to address issues related to aging and healthcare. The third most frequently used images were titled “five hands”, “flying people”, “innovation”, “it’s about people”, “presentations” and “rethinking teaching” (shown in Figures 6, 7 and 8). The “five hands” image was used to express ideas of collaboration and diversity. The “flying people” image was used to express creative collaboration and also communicate that design is about taking risks and complex problem solving that requires multidisciplinary teamwork. The “innovation” image was used to communicate that design leads to innovation and it is a multi-dimensional process. “It’s about people” literally meant what it said. Design is all about making better experiences for people and the value of design is that it is human-centered. Among the words used, the top seven words were: collaboration (used in 13), multidisciplinary (11), systems thinker (9), making (8), social impact (8), sense making (8), human centered (7).
Figure 4  Toolkit image "team discussion" used the highest number of times (9 times in collages). (Singh, 2016)

Figure 5  Toolkit images "create value" and "smiling faces" (used 8 times in collages). (Singh, 2016)
Combining themes from the collective and individual analysis of the collages, key seven themes identified for the future of graduate design education could be summarized as follows:
• Design is problem solving and sense making which indicates a clear shift from the traditional definition for design.

• Graduate design curriculum should be multidisciplinary and transdisciplinary integrating curricula from non-design disciplines such as social sciences, technology, and business.

• Graduate design education should emphasize collaboration between faculty and students, between and across disciplines and between design education and industry.

• Create value and leadership through human-centered innovation: The value of design comes from its emphasis on people. The understanding and sensitivity towards human needs, motivations, behavior and attitudes drives the innovation in design.

• Designers will be sense makers and design methodology will be increasingly used for making sense of complex information. Design education should integrate opportunities for students to tackle complex global and social problems. Graduate students should get opportunities to develop their skills at making sense, visualizing associations, and framing problems.

• Personalized program structure: Graduate program structure should be research based, flexible and personalized to the students’ research interests. Future of design offers unlimited opportunities for designers to explore.

• Advance skills for designers: Graduate design curriculum should focus on systems thinking, design research, identifying and framing problems, visualizing. Curriculum should encourage students to develop future-focused thinking.

• Learning through real world experiences by building connections between design education and industry. Projects should address social, environmental and economic problems by collaborating with public and non-profit organizations. Studio projects do not present the complexity of real-world problems. The experiences of addressing complex and wicked problems can be gained only through first hand experiences on site.

Key themes observed from each activity were compared and several common themes emerged. Figure 9 visualization shows how the data was sorted, analyzed and resulted in identification of key implications for the future of graduate design education. Figure 10 shows the connections between the themes from each activity.
The common themes that emerged from the overall primary research were:

- Design is transdisciplinary - which means that the practice and impact of design transcends disciplinary boundaries.
- Design is not only about creative problem solving but also, increasingly, about identifying and framing problems. Design research, strategic thinking, visualizing and making, which are the core skills of design can be applied to giving shape to artifacts, experiences or concepts as well as to making sense of previously unconnected abstract information.
• Design, once considered a practice of individual creativity, is gradually moving towards collective creativity.
• Just as design is structured exploration, graduate design education requires a program that supports structured exploration.
• “In a deeper sense, the true value of design is its ability to focus the attention of organizations on all of the people served by the organization.” (Buchanan, 2015). This emphasis on the human experience defines not only innovation and creativity of design but also the ethics and value system of design. As design education prepares future leaders, this human-centered thinking will become their strongest value offering.

Developing future scenarios:
Inspired by the scenario planning methodology described by Peter Schwartz in his book “The Art of the Long View”, the following 7-steps methodology was applied to develop future scenarios for graduate design education:

1. Define the focus.
2. Identify external drivers of change, their significance and implications.
3. Identify internal drivers of change, their significance and implications.
4. Identify baseline assumptions, uncertainties and select scenario logics.
5. Flesh out the scenarios.
6. Discuss implications on the focus.
7. Select leading indicators and signposts

(Step 1) The focus was the future of graduate design education

(Step 2) External drivers of change
Social, technological, economic, environmental and political factors and trends form the external drivers of change. The impact of such factors were identified to be relevant when a review of student research topics since 1980s at two highly ranked U.S. design schools showed that external factors especially technological, environmental and social factors influenced curriculum and research interests.

Social drivers of change include creative confidence / everyone can design, design thinking in business, design education in K-12 schools, health and well-being, do-it-yourself, eco-friendliness and sustainability, social media, baby boomers and the aging population. All of these social drivers are highly significant to the domain of design because they directly influence people’s preferences, lifestyle and behavior.

Technology has also been a significant driver of change in design. It has influenced design in many ways such as by introducing new manufacturing methods and materials. Technological drivers of change include: user centricity and co-creation, Internet of things, big data, 3D printing and integration of real and virtual worlds.
Economic drivers of change include: sharing economy, user-centricty and co-creation, creative economy and leadership, student debt crisis, crowdsourcing and the thriving economy of developing countries. Environmental drivers of change include: eco-friendliness and sustainability, sharing economy, reuse and recycle and climate change.

There were no significant political drivers identified that would impact design education directly. But some political factors that could have some (i.e., low) impact on design and design education include: safety concerns with travel and stay in United States, changes in immigration laws and government policies that are related to design and production of products and services.

Figure 11  External and internal drivers of change (Singh, 2016)

(Step 3) Internal drivers of change
Primary and secondary research highlighted factors and trends within the design disciplines that will have significantly high impact on graduate design education. As design continues to expand, the following were identified as the drivers of change in 2015 that are emerging within design practice and education.

- Expanding the scope by redefining Design.
  - Design is a problem solving process.
  - Design is also a methodology to identify and frame problems by sense making.
- Design education is transforming into a transdisciplinary learning experience.
• Integration of multidisciplinary knowledge.
• Design skills and knowledge for non-traditional contexts.
• Design for solving complex and wicked problems.
• Flexible, personalized and multidisciplinary curriculum.
• Collective Creativity.
  • Collaboration with others (designers and non-designers).
  • Students and faculty from multiple disciplines.
• Master of Design is the terminal degree for practice.
  • PhD will become the terminal degree in design.
  • Curriculum for the Masters program should be research based and practice focused.
  • A creative leadership program as an alternative to MBA.

(Step 4) Baseline assumptions, uncertainties and scenario logics
Future scenarios are developed on the foundation of baseline assumptions. These baseline assumptions are informed assumptions derived from those drivers of change that most likely to occur (Arup Foresight, 2014). The baseline assumptions for the future scenarios for graduate design education are:

• Creative Economy will be the dominant model of economy: Growth of companies will be based on innovation.
• Environmental crisis will continue to be a concern: Environmental crisis will continue to be a global issue of high concern. It will drive the focus of businesses, government and society.
• Design will be for everyone: Everyone will have the opportunity to participate in design processes as well as learn about design methods and tools through schools and workplace initiatives.
• Complex and wicked problems will continue to be a concern: The world will continue to deal with complex and wicked problems such as poverty, health epidemics, scarcity of food and water; problems that involve a network of things and require a systems-based solution or cannot be resolved by a single solution.
• Internet of Things: Network connectivity and smart technology will connect everyday objects and places.

In addition to identifying baseline assumptions, major uncertainties, i.e. unpredictable drivers of change, were identified. In this context the uncertainties were primarily variables – specializations that design schools will choose to support. Designers can choose to make and give shape to solutions for problems or drive the efforts in making sense of complex information for challenging situations that would lead to giving shape to innovative solutions. This refers to the scope of Design, an internal driver of change, that is expanding but unpredictable and the core skills / specialization of the designers in the future.

As the complexity of the design problems increase, the knowledge required to design solutions will have to be diverse too. At the graduate design level research interests of the students are becoming diverse and increasingly complex as programs focus on areas such as systems design, social innovation and service design. Correspondingly the curriculum
will become increasingly multidisciplinary leading up to a transdisciplinary curriculum which will be built upon core design knowledge and skills of design research, design methods and tools as well as visualization in 2D / 3D. This trend of design education transforming into a transdisciplinary learning experience, which will be an uncertainty as design schools/universities decide whether to offer a curriculum that is focused on either core design disciplines or transdisciplinary curricula.

These two uncertainties are the primary components of an educational program’s design and structure. They will influence the specializations and curricula offered by design schools / universities. Assigning these to axes of a matrix helped to construct the framework for the future scenarios, i.e., establish the scenario logics. As illustrated in Figure 12 the x-axis of the matrix represents the specialization focus: Giving Shape versus Making Sense while the y-axis represents the curriculum offered: Core Design versus Transdisciplinary.

With the scenario logics established, i.e., specialization and curriculum forming the two axes of the matrix, four future scenarios emerged for design education: design programs in the future will be focused on 1) ‘core design’ curriculum with a specialization in ‘giving shape’; 2) ‘core design’ curriculum with a specialization in ‘making sense’; 3) ‘transdisciplinary’ curriculum with specialization in ‘giving shape’; and 4) ‘transdisciplinary’ curriculum with specialization in ‘making sense’.

These four scenarios were translated into future roles for designers in the year 2031 based on the combination of specialization and curriculum of their design program:

1. Traditional Designer
2. Constructive Design Researcher
3. Hybrid Co-designer
4. Systems Sense Maker
(Step 5 & 6) Fleshing out the scenarios and their implications

The four scenarios were fleshed out based on these future roles for designers.

**Traditional Designer:** The *traditional designer* is the designer who builds and makes artifacts by applying core design and craft skills. He/she will mostly work independently but might collaborate with others to understand the requirements of the design outcome as well as to produce the design outcomes which could be tangible or intangible. The traditional designer typically gets involved towards the latter part of the product development process, e.g., after sense making has been established. This role which has been the focus of design education since Bauhaus will continue to exist but may not be the focus of graduate design education in future.

Graduate design education will primarily focus on the other three roles in the future: *constructive design researcher, hybrid co-designer, and systems sense maker.*

**Constructive Design Researcher**

The *constructive design researcher* will conduct “design research in which construction (i.e., making) takes the centerpiece and becomes key in constructing knowledge” (Koskinen, Zimmerman, Binder, Redstrom, & Wensveen, 2011). The researcher’s primary focus will be conducting design research through the constructed artifacts. These artifacts
could be tangible and/or intangible. They will be created as interventions or probes. The researcher will observe and gather data about people’s interaction with these artifacts. The analysis of data could lead to further exploration, drawing conclusions, evaluating hypotheses and/or development of theories.

The key implications for this specialization track are:

- The focus is on developing core design skills, i.e., design research, design methods and tools and visualization in 2D / 3D. Students learn to conduct qualitative and quantitative research.
- Curriculum is designed to lay foundation in design research methodologies and constructing artifacts.
- Course plan is personalized to tools and context of construction.
- Construction can be in physical, virtual or both contexts.
- Research may be conducted in the lab/studio or real world.
- Research will contribute to the understanding of how design impacts or influences its environment and human behavior.
- Students accepted into the program will either have design or non-design background with experience in constructing. For example, a potential applicant could be a computer scientist who can build virtual environments or a biologist who can build natural environments.
- Research explorations will primarily be individual efforts. They may collaborate with other researchers with common interests.
- Faculty members are primarily designers.

**Hybrid Co-Designer**

The *hybrid co-designer* is one who gives shape to design solutions by collaborating and co-designing with people from multiple disciplines. He / she typically gets involved in the latter part of the design process. He / she builds on the strategy identified to address the problem at hand. He / she combines design skills and methodologies with the methodologies from non-design disciplines to give shape to solutions. He / she takes on complex and wicked problems that require systems thinking and / or creating a network of solutions. Solutions maybe tangible and/or intangible artifacts or systems that are part of a larger complex system of things.

The key implications for this specialization track are:

- The emphasis on developing skills in giving shape to tangible and intangible artefacts.
- Multidisciplinary course plan customized to domain specialization. For example for healthcare design for the aging population, the student would take courses in design, geriatrics, gerontology, physical therapy, and human anatomy among others.
- Faculty members from diverse disciplines collaborate with peers and students to pursue transdisciplinary research.
- Research and design exploration do not lie in the realm of one discipline.
- Exploration of 3D printing technology, visualizations, framework design, virtual modelling and simulations.
• Studio spaces encourage collaborative building and showcasing.
• Companies fund their research and all students are financially supported.
• Think-tank like teams that work on local and global projects and focus on the future of things.

**Systems Sense Maker**
The *systems sense maker* is the designer who makes sense of information and systems, collaborates with designers and non-designers to develop strategies.

The *systems sense maker* is the designer who leads *transdisciplinary* collaboration to *make sense* of systems, complex and wicked problems. He / she collaborates with designers and non-designers to research and develop insights, visualize connections, frame problems, identify opportunities, develop strategies for solutions, facilitate collaboration and drive integration across disciplines. The systems sense maker is a researcher and strategist who will focus on making sense of complex and seemingly unconnected bits of information. He / she works primarily in the front end of the design process and could play a leadership role on the multidisciplinary team. The focus of the systems sense maker is not necessarily on the final solution/s but on developing appropriate and innovative strategic concepts and frameworks.

The key implications for this specialization track are:

- Students learn theories, models and concepts from across multiple disciplines and develop transdisciplinary concepts and strategies for problem solving.
- Program lays foundation for PhD in Design.
- Students will be part of one or more domain specific cohorts and will collaborate within or across cohorts.
- Research will be transdisciplinary and will focus on grass-root level issues like health issues in the developing world, business problems like organizational restructuring for innovative thinking or exploring emerging futures.
- Outcome of the work will be most likely abstract and conceptual.
- Emphasis will be on collaboration and co-creation with stakeholders.
- Program will have a leadership track preparing servant leaders who create socially responsible organizations.
- Projects will be funded by organizations like SRI International and institutes such as National Institute of Health, World Health Organization and non-profit organizations such as Bill and Melinda Gates Foundation.
- Faculty members will be multidisciplinary pursuing interdisciplinary and transdisciplinary research.
- Faculty and student are co-learners.
- Creative economy will drive the demand for recruiting such system sense makers to tackle problems that transcend disciplinary boundaries and are wicked problems.

**Step 7) Selecting indicators**
All four scenarios could exist simultaneously but have vastly different implications for program development. Design schools / universities would have to make a choice and
develop strategies they need to identify which of the scenarios would be the best fit for their institution. The indicators or trends related to factors that could guide their choices would include integration of design in K-12 education, in business and into non-design disciplines. In addition the demand of design methods for problem solving and making sense as well as the effectiveness of design thinking in addressing the challenges of complex and wicked problems.

To develop and implement any strategy for future graduate design programs, the design schools / universities would need to assess their current state and identify the requirements of their future state. The schools would also need to assess if the strategy would be a good fit for the institute, whether they have the required resources and can develop the competencies needed to implement the strategy effectively.

![Figure 13 Four future scenarios translated into future roles for designers (Singh, 2016)](image)

**Conclusion & Future Work**

The future scenarios developed from this study can serve as catalysts to provoke conversations regarding the future of design education among design educators and the larger design community. These scenarios can form the basis for developing framework and tools for developing design education programs. Prototypes can be developed on the basis of these scenarios and studies of their impact can be studied through pilot interventions.
The methodology adopted for this research can be applied in other contexts as well as be used to develop other interdisciplinary methodologies. This study was focused on graduate design education in the United States but its findings are relevant to design education globally. The research and design approach can be applied to study the future of design education in other places, for example in Europe or Asia.

References

About the Author

Sapna Singh is a design researcher/strategist and educator teaching at the Ohio State University and Columbus College of Art & Design. Her research interests focus on future of design education, design in K-12 education and integrating design into organizational strategy.
A Systems Approach to Taught Postgraduate Design Management

MACLARTY Elizabeth

Northumbria University, United Kingdom
elizabeth.maclarty@northumbria.ac.uk

Taught Postgraduate Design Management sits at a cross roads between academia and world life good practice. As such, it straddles Design knowledge and Business knowledge at the intersection of the creative practicing designer and the collective strategy of the organisation. Design academics have a responsibility to link the robustness of academic theory with practice organizational contexts, the changing external environment, and as they work vicariously through the motivation and aspirations of the third person of the student, with the creativity and craftsmanship of the designer/practitioner and they need to see this as a whole system. The paper describes the construction of a professional practice schema, a sense making system developed from longitudinal reflection, based on the perspective of a design educator, in order to provide a bridge between relevant theory and the practice of teaching and managing Taught Postgraduate Design Management (PGT) programmes. Critical Design method has been used to propose, test and reflect upon earlier versions as iterations of the schema. This version is a systemic illustration, likewise propositional, seeking feedback from the design management research community. The method of its construction uses four centres of enquiry: Pedagogy, Craftsmanship, Strategy, and Design Management, bisected by a continuum that extends from abstract generative thought to business practice.

*keywords: taught postgraduate; systems; design management; strategy*
Introduction

“teachers of design have responsibility to be as articulate as they possibly can about what they are trying to teach, or else they have no basis for choosing the content and methods of their teaching” (Cross, 2006 p.012).

The focus: PGT Design Management

As a Head of Taught Postgraduate Education (PGT) in Design at a UK University, one question dominates; is what we are teaching at Postgraduate level relevant for students and for employers? As an educator with a managerial role, what explicitly are we doing and why. How can we understand and make sense of the education experience, for all stakeholders, to ensure the currency and future relevance within an academically robust framework? How does this make business sense for the University? Within PGT, also known as Masters study at UK universities, students are predominantly international and are major income contributors (Bekhradnia, B. 2005).

Design Management, by the nature of the discipline, straddles Design and Business and encompasses professional practice situated in the context of an organization. The organization exists within an external environment of global contemporary influences. Design Management academics have a role and responsibility to link the robustness of academic practice with the organization, the external environment, and as they work vicariously through the motivation and aspirations of the third person of the student, with the creativity and craftsmanship of the designer/practitioner and they need to see this as a whole system.

This paper is the result of a series of sense-making writings and graphical interpretations, over many years, that endeavor to understand and make explicit methods and processes of PGT Design Management and to place these in the larger global context. It uses a bottom up approach where practice as a designer, educator, manager, has provided emerging data and a self-reflexive approach, seeks to produce a systematic explanation.

I propose a schema to inform the value of PGT Design Management, arguing for PGT as the cross roads between academia and world life good practice and find that drilling into the construct at any point provides multiple perspectives and conflicting theoretical, philosophical and methodological stances. Therefore, in keeping with this academic endeavor, the paper is propositional, seeking feedback in order to validate the rigour (accepted and emerging theory) and relevance to design practice contexts.

The focus is PGT Design Management. The scope of the schema is trans-disciplinary. It spans Fine Art through Design to Business. The model extends the front end of Design to include abstract generative thinking (Nokes & Ohlsson, 2001) moves through the discipline of design as craft (Frayling, 1993; Sennett, 2008) through to design as strategic innovation (Aftab, 2012; Nixon, 2016), and the theory and practice of business (Leidtka, 2016). At its core is the relationship of design to business (Skoldberg–Johansson et al., 2013; Stephens & Boland, 2015) that is design management.
Literature review

The boundaries of design practice and research

As a fairly new academic discipline in comparison to the traditional disciplines, Design is now well documented and exploits a gap between the paradigms of Science and the Humanities and Arts, as a fundamental aspect of human intelligence (Cross, 2007). There are now well-accepted arguments and evidence of the nature of design activity, design behavior and design cognition (ibid) with established epistemology and knowledge.

Due to the naturally unconventional approach of designers to research, their use of heuristics, and bricolage research methods (Yee & Bremner, 2011), the boundaries of design research have become increasingly blurred. The designer’s practice has evolved to encompass ways of thinking and acting as well as the traditional design/making skills (Kimble, 2011), so that ‘professional design is now operating within an expanding and increasingly complex field’ (ibid). This has led to the acquisition of an extended research territory for design, which reaches out to and into other disciplines.

There is arguably an element of self-vindication, as the majority of design doctoral work tends to remain within the design discipline itself and is therefore judged and validated by designers, the research field and its credulity is self-perpetrating. As the discipline evolves, the boundaries of design have become increasingly negotiable, as design re-defines itself as trans-disciplinary or even an inter-discipline (Kimbell, 2008), alter-discipline (Rodgers & Bremner, 2013) or a para-discipline (Young, Lievesely, Warwick & O’Leary, 2017). Other disciplines are moving towards a design perspective, there is a ‘growing trend in business schools to investigate design - often under the term of innovation (Buchanan, 2002). Nixon (2016) describes this as a crisis of ownership, who owns innovation? This is particularly relevant to Design Management operating in the grey area at the intersection of design and business.

Design Management and Design Thinking

The popular recognition of design thinking has made the value of design to business current and increasingly explicit (Martin, 2009; Brown, 2009). Design as a way of thinking and as a decision-making activity (Simon, 1996); as a way to approach business problems (Boland & Collopy, 2004); as a way to impact organizational change through practical design activities (Buchanan, 1992). The fuzzy front end of the design process has been widely linked to solving wicked problems (Buchanan, 1992; Rittel, 1960), that is problems not solved by analytical thinking alone and has become to be understood as a way to understand complex social and world issues (Sanders & Stappers, 2008; Brown, 2008).

Design thinking linked to Innovation and Social Innovation has engendered a human centred approach, generating business transformation by “reorienting organizations around the people it serves” (Cooper et al., 2011). DT and design methods are being used to identify unmet needs, providing fresh perspectives on markets and new business opportunities. The design practice attributes: to imagine, to visualize and dream up new visions, and alternative scenario building are being used to reinvent business (ibid).

Cooper et al (2011) argue that DM has matured and can challenge the fundamental “assumptions, values, norms and beliefs that make an organization what it is”.  

1743
In the relationship between design and business, it has become increasingly understood that neither business alone, nor design alone is enough. That changes in society and technology challenge conventional understanding of what is valuable (Verganti, 2016) creating a need for new criteria.

We now have a situation where creative thinking, design processes and design practice can be applied along a continuum from traditional making to the whole of business!

**Design Thinking and Business Thinking**

The relationship between management research and design research has become entangled in mainstream practice, manifested in design thinking, innovation and design management. Yet little literature exists about the comparative concepts and approaches (Johansson-Skoldberg et al., 2013) and underlying value assumptions of the different knowledge paradigms (Poldma, 2015).

The merits and failures of Design Thinking as a concept for management has been extensively discussed in the popular press (Brown, 2009; Lockwood, 2010; Curedale, 2013; Nussbaum, 2012) however, surprisingly little is written linking the two fields of design and management in academic writing (Johansson-Skoldberg et al., 2013).

The use of the term Design Thinking belies the differing aspects and understandings of the term (Norman, 2010; Kimbell, 2011; Stephens & Boland, 2016) and, although seemingly popularly understood, Design Thinking is not seen to draw extensively on organization research (Kimbell 2011, Stephens & Boland 2015, Johansson-Skoldberg et al., 2013).

From a design research perspective five sub-divisions of discourse in DT are identified by Johansson-Skoldberg et al. (2013):

- Design as designerly thinking as the creation of artefacts (Simon, 1969),
- Design and DT as reflexive practice (Schon, 1983)
- DT as problem solving (Buchanan, 1992, based on Rittel and Webber, 1973)
- DT as a practice-based way of making sense of things (Lawson, 2006; Cross, 2006)
- Design and DT as the creation of meaning (Krippendorff, 2006).

Another division, Design as a Strategic Tool identified by Kotler and Rath (1984), initiated discussion within management discourse around the strategic use of design in organisations. DT gained support within management thinking as a way to contribute to innovation (Brown, 2008; Martin, 2008) and a growing recognition that analytical thinking alone could not address indeterminate organizational problems for practicing managers. This thinking was brought into education, prominently by Dunn & Martin (2006), however: “Similarly to the theoretical discourse, the education streams have remained separate” (Johansson-Skoldberg et al., 2013, p.128).

Recently, Leidtka (2016) makes a strong argument for Design Thinking as a paradigm shift for organizational thinking, which she argues will be seen to be as influential as TQM to the management discourse.

**The Connectivity between Design Thinking and Systems Thinking**

“By definition, a system is the totality of all that in our effort to navigate the systems and environments that affect our lives, we create symbols or representations that attempt to express the idea or thought that is the
organizing principle. The idea or thought that organizes a system or environment is the focus of the 4th order of design”.

(Buchanan, 2001)

Interaction is a recent domain that has strongly affected design thinking and design research by focusing on the environments and systems where interactions take place (Buchanan, 2001).

Systems Thinking can be “characterised by the interactions of its components and non-linearity of those interactions “(Jackson M.C, 2003, Walonick D, 1993 cited in Mugadza G. 2015). Mugadza suggests Design Thinking and Systems Thinking can be seen as complimentary approaches, both based on ‘pattern language’ as methods of describing large complex problems. Albeit using a different language.

Buchanan has been influential in highlighting the nature of design problems with the values of design and systems thinking (ibid). Similarly, Sevaldson (2013) identifies design attributes which match the systems approach to problems and synthesizing solutions:

- being comfortable with complex and fuzzy material
- good at visualising – an enormous advantage for thinking in complexity
- creative people are trained to come up with new solutions
- generative diagramming
- Integrative rather than divisive approach

The systems oriented designer he argues is dealing with an holistic view where the interest is in looking at a complexity of relationships, interactions and patterns, rather than hierarchies and boundaries (ibid, 2013).

A systems approach, therefore, in keeping with design has a notion of wholeness, is interdisciplinary and a way of looking at the world through a framework of ideas. Integrative thinking and sense-making (Kolko, 2010) are acknowledged as design characteristics (Martin 2009), these shared attributes with systems thinking has led to an interest from the field of design into systems and complexity science (Johnson, 2009). We are seeing movement towards integration of thinking across systems, across disciplines and value systems (Sevaldson, 2010). The designerly approach to complexity, wholeness and sense making and movement towards systems thinking, promotes the blurring of the traditional research boundaries.

**PGT education**

“PGT is a pivotal learning transition point where a shift in thinking occurs to enable the individual design practitioner to integrate and develop their capabilities into a business strategy. It provides an opportunity to develop and mature as a practitioner or thinker in the future work place” (Maclarty et al, 2015).

In the practitioner’s development from UG to work, PGT sits at a crossroads. Arguably this process of transition holds the key to the value of PGT programs. Accordingly, which capabilities to develop and how these can be developed becomes the issue of mastery, or what to do at masters’ level (PGT).
PGT Design Management students usually have a Bachelor degree in either business or design (sometimes neither). Because of the nature of higher education, teaching systems within universities tend to deliver either business or design discretely, making it difficult to span the two disciplines. To ‘find’ design management, students commonly have encountered in practice some need to better understand either business or design to advance their careers. PGT design management addresses this polarization of approach across the two disciplines.

PGT in this paper is presented as a professional practice model, a gear change or paradigm shift. Bachelor students move from a specific field of making to “masters” by being able to use a design understanding for different situations outside their subject specific discipline background. This ability to domain shift (Sennett, 2008) enables the students to develop processes to cope with uncertain, messy situations (English, 2008; Schon,1983).

An ability to act meaningfully in future life scenarios has resonance with the notion of ‘Thrownness’ (Gerworfenheit), “Being thrown into a situation where one cannot oversee the consequences of one’s own actions. Not acting, also has a consequence.” (Sevaldson 2014). Domain shift can be seen as a pivotal point to the understanding and learning of PGT, as the bridge from academia to life and work. It enables a shift to a ‘Management’ practice role, which encompasses responsibility for others, and the long-term wellbeing of the organization (Sennett, 2008; Young et al., 2007).

The personal time based trajectory or design maturity of the student/practitioner consists of developing personal competencies and capabilities, and whereas UG can be thought of as knowing and doing, the what (Sinek, 2012); PGT takes a reflective/reflexive practicum understanding; what you know and how you do it, and consequently, what you do not know and need to develop. Moving from the ‘what’ to understanding the ‘how’ (ibid). That is to be a reflective practitioner. The reflective approach has value on two levels, it develops both the understanding of the situation and how to deal with this in the future and develops personal competencies (English, 2008).

**Strategy: The workplace and the global external environment**

Strategy is the blueprint of how the organization will work, including all other operations. Classic strategy theory asks: Where are we now? Where do we want to be? And how are we going to get there, that is: analysis, formulation of options and implementation (Johnson, Scholes & Whittington, 2011).

Strategy provides direction (Collins & Porras. 1996). Strategy theory is based on the assumption of change in the external and internal environment and the consequent building of capabilities to fulfill stakeholder expectations (Johnson, Scholes & Whittington, 2011). Change and complexity are aspects of the external environment in which organizations exist (Mootee, 2015).

The workplace, through its strategy is developing and growing. It exists in an external environment that is morphing and constantly changing providing a, chaotic complexity that the organization has to navigate to survive. It is in a state of continuous response and learning, held together by strategic intent (Hammel & Prahalad’ 1989; Leidtka, 1990). For organizations facing rapid change “only those that are flexible, adaptive and productive will excel” (Senge, 1990).
The attractiveness of strategy to the designer is that it corresponds to many design attributes. It sees the big picture, and is holistic. It is about the future and what does not currently exist, and is therefore, dependent upon vision, creativity and imagination. It can provide flexible, credible options for the future depending on how you frame the question of what to do.

Whereas business analysis is based on empirical theory and rational scientific thinking, formulation of options requires looking to the future and visualizing what is possible.

The breadth and opportunity within the Options and Choices is dependent upon divergent thinking and how to build up, understand and be comfortable with complexity (bounded rationality). Unlike analytical thinking for which all proof emanates from the past, (Martin 2008) the ability to problem frame and how to deal with change and the future requires abductive thinking (Kolko, 2010) which is in contradiction to rational, analytical, reductionist business thinking.

Learning
Abstract generative thinking is recognized as a theory of deep learning and defined as: generative, that is “can articulate a sequence of temporally related action”: abstract, “not bound by surface features. Knowledge is flexible and could be applied to novel stimuli” (Nokes & Ohlsson, 2001). Abstract generative thinking can be used to solve deep complex, novel problems by retrieving past learned information and applying it.

Tan (2012) notes that designers layer up knowledge in strata, through experience for reference. The building of layers through the accumulation of tacit understanding, implicit and explicit learning and experience, the development of skillful practice and personal capabilities are time/doing dependent. Dreyfus’ (1980) identifies mental states from novice to master performer where the higher skill states are achieved by moving through the preceding stages. Skills are acquired through iterative doing and repetition. Sennett quantifies 10,000 hours of practical doing, as the time needed for an apprentice to reach a level of expertise in his trade (Sennett, 2008). Although this time span is contested by different authors in terms of different types of doing to become proficient.

The acquisition of skills, skillful practice and professional competence are defined from different perspectives within different disciplines. Craftsmanship (Sennett, 2008), artistry (Schon, 1987) Designerly process of becoming a designer (Dorst & Cross, 2001). All have in common the acknowledgment of levels of acquisition and maturity - leading to an aspirational state of intuitive fluency (Csikszentmihalyi, 2002; Dreyfus & Dreyfus, 1980; Sennett, 2008).

Methods
A Pragmatic Theory approach has been adopted based on practical work drawn from real life curriculum development, teaching practice and collaborative student design project experience (Bailey et al., 2015; Maclarty & Aftab, 2015). The research methods refer to Research through Design (RtD) (Frayling, 1994).

The perspective is of a Design educator/manager, taking a designerly approach crucially generating complexity, and interpreting it.
Complexity was built from practice and experience of PGT. This was accomplished through mapping, visualizing and drawing, and ultimately sense making “A way of understanding connections between people places and events that are occurring now, in the past, in order to anticipate future trajectories and act accordingly” (Kolko, 2010). With the aim of making as much of the processes and their relationship across disciplines of PGT Design Management pedagogic practice as understandable as possible. Hence the guiding methodology for the work has been reflective practice cycles through a process of Critical Design exploration and writing.

A schema has been constructed using mapping techniques to describe what’s gone before in order to explore, understand, refine and ultimately create a more reliable generic map/framework for PGT. Through this process identifying the fundamental aspects and relationships with new understanding. The final phase of this Critical Design and reflection on practice process, beyond that described in this paper, will be the extended evaluation of the schema through an extensive cycle of peer review, including its use as a reflection on practice tool to assist personal development plans by PGT students.

The research process parallels the design process. A process of feedback, post-hoc rationalization, and reflective practice (Lewin, 1952; Schon, 1983; English, 2008) uses a critical design cycle mechanism, testing present ideas and testing new ideas for particular and different audiences through practice and academic papers.

The anticipation of the research is that by visualising and making sense of a complexity of procedures, and through constructing a framework of ‘what is going on’, should help the DM educator to predict and manage the system and identify tools for understanding and interpretation.

The schema is a method to make aspects of PGT visible, visual and explicit, to be able to see the interactions and interconnections as a single system, in order to be able to manage the system as a design educator/manager; managing staff, students and curricula.

Central to the designerly approach taken is the generation of complexity and its interpretation. Implicit processes of PGT have been made explicit through modeling and visualizing, externalizing the experiences and knowledge. This holistic exploration of the situation becomes a value arena (English, 2012) seeing separate elements as relational and fluid. This process of multiple perspective problem framing (MPPF) (ibid, 2012) of rearranging and maintaining the fluidity of information around what is important, allows different interpretations of the data from different perspectives (ibid). In this case the educator, the practitioner, the student, the organization and the university, making new connections and relationships depending how the problem is framed. This process of reframing underpins the academic papers written to date, which address aspects of PGT from different perspectives and form the basis for the schema, its construction and testing.

Through reflection and post-hoc rationalization it became apparent that a systems approach was being used and could support the PGT schema. This has led to interest in the relationship between complexity science, systems and design as articulated in this paper.

The construct is a 3D model, formed on a platform of practice, layering literature, data and methods, philosophy and academic papers (Maclarty, 2001; Young et al., 2009;
Maclarty & Aftab, 2015; Maclarty et al., 2016). Drilling into the model at any point provides multiple theoretical, philosophical and methodological perspectives.

The author has taken radical constructivism as the standpoint for the paper. We make our own reality. The construct is built up and framed as a complex system, this perspective enables the visualisation of the system to be seen and interpreted from the multiple perspectives of the different stakeholders and can therefore span the methodological differences.

Exploring and clarifying the standpoint of radical constructivism and multiple perspective problem framing with systems thinking to support the schema is the subject of further study. This brings into focus questions of mobility, credibility and acceptability of thinking across disciplines and debate around good practice and research evidence.

**Introducing the PGT schema**

With a preliminary training in fine art and a craft practice background, an MBA, working as an industrial designer, my perspective on Design has been shaped from outside the discipline. I see Design as a very important and useful territory of knowledge along a creative journey from abstract generative thinking to business thinking. Design as the practical application of creative thinking to craft things for the real world, to get a job, which necessitates understanding the relationship of the world to designing and making, and eventually the relationship of the thinking and practice to the organization.

The schema is made up of 4 centres of enquiry: Pedagogy, Craftsmanship, Strategy, and Design Management (see Figure 1, below). Originally based on an energy model for organizational learning (Pedlar, Burgoyne & Bodell, 1996), used in 2001 (Maclarty, 2001) and further adapted in this paper. The knowledge quadrants fire off each other in continuous iterative cycles to inform practice and practice to inform theory. The construct is a learning model, one sense-making system for the PGT DM educator. Seen as a systemic illustration, which allows for interpretation from many perspectives and different stakeholders and contexts: the educator, the student, the organization, the university as a business, and academia.

**An explanation of the schema**

Central to the PGT schema is the relationship of craftsmanship and strategy as fundamental approaches and knowledge bases needed by the design manager.

The term craftsmanship (Sennett, 2008) or artistry (Schon, 1983) incorporates (as indicated by the words around the quadrant), hands on doing and making, skillful practice, and creative thinking and the notion of intuition. The decision to call this craftsmanship originated from a conversation with Johnathon Ive on a visit to the university to meet students. When asked by students what he looked for when employing designers – he replied craftsmanship.

It also derives from Mintzberg’s metaphor of the craftsman potter and strategy (Mintzberg, 1987). This is supported by Burghi et al. (2005) seeing the “strategist as a hands-on craftsman” and a link between the hand and brain with important implications for organizational practice.

Craftsmanship includes the skillful practice and thinking of the designer.
Strategy provides the context and situation. Strategy addresses the managing of design and innovation within the organization and implementing future opportunities. The organization, its strategy and the environment are in a state of constant change. The approaches (craftsmanship and strategy) are taken from Design and Business and retain the separate disciplines epistemology.

Referring back to the schema: Pedagogy and Design Management are the practice outcomes from craftsmanship and strategy (see figure 2)

Pedagogy encompasses a 4th dimension of time where theory, practice, experience and a personal trajectory of capability building are elements of interplay for practitioners.

It is the position of the practicing design educator within a university and academia, with learning students, learning staff, in learning organisations (as shown around the quadrant). The specific context of Postgraduate studies also sits here.

Design management practice combines design knowledge and business knowledge (as shown around the quadrant) and is manifested in design thinking and innovation. The core
practice of creative thinking, generating and interpreting complexity transposed into value propositions for business, provides a framework for innovation practice.

**Learning model of practice**
For the design management student or practitioner, the spectrum from abstract generative thinking to business is a continuous, iterative learning model of practice and maturity. Learning through doing, understanding the past rules of practice and theory and moving to the next stage of understanding. The postgraduate student attains efficiency at undergraduate level, moves on to a workplace experience, where, in time they need to acquire other and different skills. As a postgraduate, their learning starts afresh. These layers of learning (Tan, 2012) become the building blocks of tacit knowledge and experience.

**Design maturity and the building of personal capabilities**
The student/practitioner’s trajectory, or design maturity is built from a complex series of personal learning experiences, both as an individual through the internal higher education system/apprenticeship (craftsperson /designer), and later as part of an organizational strategy (an element in a collective) as a practitioner. The individual designer learns their trade (apprenticeship or UG, in the period of up to 10,000 hours (Sennett, 2008) and matures, grows, and to be employed (or self-employed) needs to be able to fit and have value working as part of an organization or a collective of some description. The organization is also learning and changing (Senge, 2005). Gilsling and Gardien (2013) provide a maturity matrix identifying three learning stages of design needed by Philips, in order for them to resource their long-term innovation strategy. They identify design as capability (refers to the design community itself), design as approach (co-creation and design thinking with other disciplines), design as outcome (controls the specific contribution design makes to the organization). Design as approach aligns to the level of postgraduate learning where individuals can integrate design into business strategy and bridge vision with reality (Maclarty & Aftab, 2015).
Figure 2 PGT schema showing practice outcomes along the continuum from abstract generative thought to business

Design management practice
For the design management student/practitioner, different learning, knowledge, skills and practice are acquired at different intervals along the continuum from abstract generative thought to business thinking: the continuum from design to business bisects craftsmanship and strategy (see Fig. 2). The application of design to business and business to design, the balance of the discipline thinking will vary according to the individual/individual’s role in practice, and gives us Design Management in its broadest terms. The transposition of skilful practice of the designer into DT is the basis for innovation practice (Brown, 2008). Further along the continuum towards strategy, as DT is used to add value to the organisation, the focus and practice becomes how to manage innovation. The question for design managers becomes, which tools to use and when.

By presenting a continuum, across the polarization of design and business (craftsmanship and strategy) enables scrutiny of the creative intersection where design managers act as designer/practitioners and strategist/thinkers (Aftab, 2012), in the strategic use of design.

It is a 3D model - drilling into the model at any point provides multiple theoretical, philosophical and methodological perspectives.
Conclusion
Designers can be likened to magpies. They pick up and use whatever they can make sense of within their practice and research and this appears to be sanctioned by the design discipline itself, impacting and extending the research and practice boundaries of the discipline. Other disciplines (business, social sciences) are reaching out into the shared spaces of innovation, and design thinking. Communities of practice around health, government, and societal issues are necessitating a cross boundary discipline approach to solve their problems.

The relationship between management research and design research has become entangled in mainstream practice, manifested in design thinking, innovation and design management. Yet little literature exists about the comparative concepts and approaches (Johansson-Skoldberg et al., 2013) and underlying value assumptions of the different knowledge paradigms.

Systems theorists have, for a long time been part of design, however, this has been to date the interest of specialist scholars. Sevaldson (2017) suggests that a new wave of systemic design is emerging, concerned with “creating new synergetic relations between systems thinking and design” (ibid).

Complexity theorists also share systems understanding, and this starts to demonstrate, and pull out, different philosophical approaches and perspectives.

*Complexity theorists use a realist epistemology and assume that complexity exists in an observed system... Cyberneticians use a constructivist epistemology and assume the system of interest is defined by the observer.*

*An observer constructs a representation of a system in order to be able to manage a system of interest hence cyberneticians assume that the task is to manage complexity through a circular process of interaction and interpretation. In a social system, observers both construct descriptions and participate in the operation of the social system using those descriptions (Umpleby, 2008)*

*(The International Multi-Conference on Complexity, Informatics and Cybernetics, 2013).*

The designerly, sense-making approach taken for the schema is based on similar thinking to the cyberneticians, representing a system that spans fine art, design, business and pedagogy. The design educator/manager constructs and participates, in order to manage the system.

The paper starts with a definition of design education practice:

*Design academics have a responsibility to link the robustness of academic theory with practice organizational contexts, the changing external environment, and as they work vicariously through the motivation and aspirations of the third person of the student, with the creativity and craftsmanship of the designer/practitioner and they need to see this as a whole system.*
The schema endeavors to provide such a system. Its strengths lie in its foundation built from the practice of design, business and education. It provides knowledge approaches from the same foundation focusing on specific thinking and arguments from craftsmanship, strategy and learning, both from a discrete discipline perspective, but also finds connectivity and relationships.

Seeing the schema as a system, enables the educator/manager to construct and participate in the system, in order to manage it.

Crucially, the systems approach can accommodate the ‘vicarious’ nature of design education. It can contain the students’ aspirations and motivation, their building of capabilities and their maturity. It spans PGT with the workplace. Guiding factors for strategy are change and the building of resources over time. For the practitioner in work, they need to continue to learn, develop and mature and add value to the organization. Strategy incorporates continuous learning and professional development (CPD) within the organisation, the schema extends to this.

The schema goes some way in describing the practice of design management, illustrating the range of possibilities and opportunities along the continuum identifying the practice of innovation and innovation management. This provides flexibility for individual strengths and capabilities and learning, now and in the future. Whether practitioner or strategist thinker (Aftab, 2014), it informs the corporate arena for the strategic use of design.

The paper suggests that Design combined with systems thinking can contribute to a revised understanding of theory and practice enabling mobility of thinking across Design and Business (needed for the design educator), providing thinking that is integrative rather than divisive (Sevaldson, 2010). However, it exposes discussion around the boundaries of design research and integration and contributes to debates across the disciplines of academic rigour and practice evidence.

**The stand point of the researcher**

The weakness is the philosophical standpoint. The taking of a radical constructivist approach enables multiple perspectives and the ability to view the complexity from the point of view of different stakeholders (English, 2010) as seen in the schema. The connectivity of systems, radical constructivism and the schema is not yet resolved, but forms the questions for the next iteration of reflection and writing.

Knowledge construction and value assumptions are defined by the position of the individual researchers (Poldma 2015). Our understanding is fragmented and seen through the lens of individual researchers and the questions they ask. It therefore becomes difficult to get a consensus on the different approaches, either conflict of concordance within the systems we are building.

The findings suggested that practitioners could, and indeed do, move from one discipline and approach to the other in order to innovate (Maclarty et a, 2016).

It would appear that practice sees no boundaries, however Consilience ‘agreement between approaches to a topic of different academic subjects, especially science and the humanities’ (Oxford English Dictionary) brings into focus questions of mobility of thinking, hegemony and power and credibility of thinking across disciplines and debate around good practice and research evidence.
The stand-point of radical constructivism and multiple perspective problem framing encourages divergent viewpoints out with the design approach. There seems to be an appetite beyond design for a holistic way of looking across academic silos. However, the powerful evidence based lobby find much to oppose in this. The question is does this matter more to rigour rather than its relevance?

References
Aftab, M. (2013). Design as a functional leader: a case study to investigate the role of design as a potential leading discipline in multinational organisations. Northumbria University, Newcastle Upon Tyne.


Dreyfus, S.E. and Dreyfus, H.L., (1980). A Five-Stage Model of the Mental Activities Involved in Directed Skill Acquisition, Storming Media.


Kolko , J. Sense making and framing: A theoretical Reflection on Perspective on Design Synthesis DRS 2010 conference proceedings


About the Author

Elizabeth Maclarty was previously Head of Taught Postgraduate Studies and Continuing Professional Development. Her interest is in the polarity of design and business approaches, taught postgraduate design education practice, innovation practice and strategy.
This page is intentionally left blank.
Cultural Context and Service Design: developing critical and meaning-making capacity

SANTAMARIA Laura*; ESCOBAR-TELLO Carolina; ROSS Tracy and BOHEMIA Erik

Loughborough University, United Kingdom
* Corresponding author: l.santamaria@lboro.ac.uk


This paper reports on the experimental introduction of a socio-cultural lens to the design process, to aid in mapping symbolic aspects of consumption: i.e. users’ expectations, aspirations and identification needs and the socio-cultural rules at play in the context of the innovation.

An action research intervention was implemented with design students to investigate how applied semiotics and cultural analysis methods support user research and meaning-making during the design process. Students were provided with theories, activities and templates to facilitate the exploration of global and local socio-cultural trends, positioning of innovation in the cultural category and mapping codes and other contextual socio-symbolic signifiers that influence users’ preferences and choices. Results indicate that cultural context analysis contributes to build critical thinking skills and capacity in designers, and enables a wider awareness of the mediating role of design in the acceptance and diffusion of innovations.

keywords: cultural analysis; applied semiotics; meaning-making; service design

1. Introduction

Service Design, a rapidly growing area of professional User Experience Design is increasingly taught within Interaction Design and related programmes, as a user-centred approach to innovation that involves systemic thinking, and the design of multiple touchpoints between the service and the users. Service designers may be involved in concept generation, creating operational structures and a consolidated product-service system, but they also leverage the appeal and uptake of the innovation by creating intangible – or ‘symbolic’ – value using cultural references and narratives to make the
innovation relevant and meaningful in its context. By ‘framing’ innovations with socio-symbolic referents, designers legitimise and position innovations as relevant and aspirational offers in the socio-cultural context where they are deployed.

However, it is argued that dealing with these meaning-making aspects stretches the traditional skills of the service designer beyond the technical and organisational aspects (utility and usability) into new dimensions such as the formulation of value propositions, and the translation of this offer into meaningful user experiences. Dealing with socio-cultural aspects requires building new capacities and skills in designers to ensure the innovation’s relevance and appeal in the context where it will operate.

This research introduced methods from Applied Semiotics and Cultural Studies to support designers in mapping the socio-cultural rules at play in the innovation’s context, in order to draw socio-symbolic ‘design constraints’. Methods from these disciplines are being increasingly adopted in commercial contexts (e.g. in branding, product and service development) to enhance cultural resonance, overcome cultural barriers and facilitate market insertion and adoption.

2. Literature Review
Innovation uptake is largely dependent on the ability of the solution to improve users’ quality of life through the offered (tangible or intangible) benefits (Norman & Verganti, 2014; Tukker, 2004). Thus, developing relevant and desirable innovations in a saturated market requires a sophisticated and deep understanding of users, and the socio-cultural factors that influence choice.

2.1 Cultural consumption and symbolic value
In a global consumer culture, brands establish a symbolic exchange through the meanings consumers attach to the brand name, logo, and product category. This symbolic meaning (desirability, identity and legitimacy) is not just a value added to the financial value of goods, but has material impact on financial markets themselves (Oswald, 2015).

Designers construct symbolic value by ‘framing’ artefacts. They create narratives that associate goods, services and brands with certain values, attributing identity and meanings to them by recalling existing cultural references or codes (du Gay et al., 2013). Thus, as ‘cultural intermediaries’ (Negus, 2002), play a central role in the production of symbolic value through all designed artefacts. Hence, design artefacts are affected by socio-economic settings, but also effect the legitimation of values, practices and identity.

2.2 Context and consequences
Cultural context plays a considerable role in the perceived value of innovations. To be perceived as relevant and desirable, products and services need to be rooted in the context where they will operate (Clatworthy, 2011; Crilly et al., 2004; Wong, 2004). This implies that the designer should be able to navigate the socio-cultural context, mapping existing offers, considering the user needs in light of such offers and identifying what aspects of the user needs can be met, or improved by innovation that are not currently met by existing offers.

Clatworthy (2012) points out that to build desirability in services it is necessary to incorporate ‘details’ from the innovation’s context to the design: ‘details that the user can
perceive as belonging to their lifestyle, are coherent with the user’s other lifestyle choices, the way they think and the things that express their identity and who they are’ (ibid, p. 85). Equally, Crilly et al. (2004) highlight the role that external visual references (or stimuli) play in influencing decision-making, paying attention to the personal, situational (contextual) and cultural factors that moderate user response. Therefore, appearance and experience are paramount when considering innovation adoption because they influence both commercial success and user’s quality-of-life or subjective well-being (Crilly et al., 2004; Kahneman, 2012).

Furthermore, as ‘taste creators’ (Bourdieu, 2010), designers inevitably affect people’s orientation towards certain goods as legitimate, worthy and desirable, playing a substantial role in the adoption of radical innovation, but also bear responsibilities as the effects and consequences of artefacts are political (Zingale, 2016). On one hand, design outputs stimulate people’s imagination and satisfy wants and desires; on the other, people’s social attributes are reconstructed under the impact of these outputs, which can lead to many new social and environmental problems. Tie et al. (2014) argue that ‘in this process, designers as important conceivers and practitioners need to reflect upon their role, from the perspective of anthropology and sociology, and on the question of how to balance between the ‘material needs of individuals’ and the ‘commonwealth of society’’ (p. 346).

In summary, understanding the socio-cultural landscape of innovation draws attention to consider the appeal and orientation generated by design, but also enables more responsible practice by raising awareness of the consequences the innovation bears for users and context.

2.3 Dealing with the socio-cultural dimension: design skills and capacities
Product and service system innovations are complex offerings whose design require the consideration of multiple aspects, such as technology, development actors, users and context (Morelli, 2002) – all equally involved in the definition of the final configuration. Morelli (2003) describes three different aspects as complimentary design dimensions: technical, organisational and socio-cultural domains (Figure 2).
• The first domain refers to the technical capabilities and skills for developing innovative aspects of the product or touchpoint design.
• The second domain refers to the ability for reorganising functions around innovative patterns. Such a domain is close to the discipline of design management.
• The third domain (socio-cultural dimension) concerns the ability to influence innovation processes and to determine the paradigmatic context (meaning) in which new products and services can be accepted or refused.

Morelli argues that traditional design skills and capacities are strongly projected upon the technical and the organisational domains. However, ensuring contextual insertion is a critical part that determines the innovation’s success (Norman & Verganti, 2014), and therefore, an understanding of socio-cultural referents is relevant to the development of service innovations because this often enhances or limits their potential acceptance and diffusion (Morelli, 2003; Zurlo & Cautela, 2014). Fulfilling this role successfully is highly dependent on the designer’s capability to observe and interpret cultures, social needs and attitudes. Although this is an intrinsic characteristic to the design activity, support and capacity to perform these tasks during the design process needs developing, because innovation framing is mostly conducted in an intuitive manner (Kazmierczak, 2003).

2.4 Applied Semiotics

The application of semiotics to consumer insight and marketing is now a well-established, powerful complimentary methodology to conventional market research. Marketing semiotics experienced a sharp rise in influence with the growth of brand strategy and management since the 1990s, and particularly with the rise of megabrands requiring cross-cultural and global communication platforms (Evans & Shivakumar, 2010). Semiotics is employed in commercial contexts as a strategic tool set to elaborate sophisticated ‘cultural insights’. Some benefits include the ability to create disruptive innovation by
identifying emerging meanings and breaking the current normative codes; and foresight in identifying patterns of change in culture and anticipate trends. Semiotic research is employed as a strategy for mainstream diffusion of innovations, as it helps to identify emergent cultural themes (e.g. practices or trends) that have a strong likelihood of spreading into the dominant or mainstream culture (Evans, 2014).

The semiotic approach concentrates on uncovering ‘naturalised’ meanings which users are often unable to articulate, because these operate largely at subconscious level (Oswald, 2012). While many market research methods try to understand the user’s preferences in isolation, semiotic methods acknowledge the individual’s beliefs, preferences and behaviours conform or confront ‘implicit’ socially agreed rules expressed through social signifiers to mark status and belonging, and so forming ‘in’ and ‘out’ groups. In contrast to traditional market research, which gains insights mostly by consulting users directly (e.g. by means of interviews, focus groups and questionnaires), marketing semiotics draws insights from the study of discourses expressed via popular culture representations (media, advertising, music, film, etc.) by employing semiotic, cultural analysis and ethnographic methods (Oswald, 2012).

Evans (2014) reports a set of ‘simplified’ semiotic tools directed to improve brand communications, position new brands, products and services in the ‘mainstream cultural landscape’ and for radical product innovation (innovation that is not based on existing customer needs). Figure 2 illustrates the typical ‘cultural landscape’ generally analysed for these purposes. Figure 3 illustrates Evans’ process, which comprises two main stages: Decoding (analysis) and Recoding (incorporating findings into design and communications).

![Figure 2 Cultural context landscape (Evans, 2014)](image_url)
This aesthetic-semiotic approach offers potential to equip designers to deal with socio-cultural aspects of innovation. Applied semiotics methods can support designers in ‘deconstructing’ the innovation context, and in the strategic selection of ‘cultural codes’ that can be incorporated by design to construct value propositions that are better rooted in its socio-cultural context, and therefore perceived as desirable and relevant. However, while these methods offer great potential to aid with this task, they are normally implemented by professional semioticians and market researchers – not designers. Therefore, the capabilities and requirements for their integration to the service design process needed to be empirically investigated.

3. Method
The intervention investigated how cultural analysis and applied semiotics could support socio-cultural context research during the design process, in order to generate more relevant service value propositions. Equally, it was sought to identify how teaching these methods could aid in developing critical analysis and meaning-making skills and capacities through design education.

3.1 Participants selection
To this end, the researcher implemented an action research intervention with MA Interaction Design and User Experience students, as part of the Service Design for Social Innovation course, designed to provide the student with practical experience and competence in service design from a bottom-up innovation perspective. Working in teams, students engage in a collaborative project to generate innovations based on a clients’ brief, which in this instance, was provided by a consortium of local authorities and businesses. The challenge was to make the town’s heritage more visible and invigorate the local tourism ‘offer’. The students in the cohort were from diverse cultural backgrounds.
3.2 Data collection and analysis techniques
The workshop and tutorial sessions were captured in audio recordings and photographic records. Feedback from students and tutors (about the intervention itself and other situational and contextual nuances) was collected through semi-structured interviewing. Document analysis (student’s log books and reflective accounts) were used to understand (in the context of their learning experience) students’ sense making of the tools and methods used. Transcripts of the sessions and interviews were analysed thematically. Document analysis of the module guide, students’ logbooks and reflective accounts was employed to obtain further insights. These were also analysed thematically and compared with data from the interviews and other feedback.

3.3 The AR Intervention
The researcher engaged with the students in the role of assistant tutor, once-weekly over a period of six consecutive weeks. The study design was based on Tripp’s (2005) four step model: Plan, Implement, Evaluate and Reflect (Figure 4).

![Action research cycle](image)

Figure 4 Action research cycle

4. Process
4.1 Step 1 – Plan
Familiarise – The researcher familiarised with the module guide, the students and the learning environment by attending colleagues’ sessions and through informal conversations with the module leader.

Plan action – In agreement with the module leader, the intervention was planned as a workshop scheduled within the timetable, followed up with tutoring support (Table 1).
<table>
<thead>
<tr>
<th>What</th>
<th>Why</th>
<th>How</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Deliver Context and Sustainability workshop</td>
<td>To introduce to student’s theories, methods and tools for mapping the innovation’s context and organising research insights</td>
<td>Timetable in single session (3hs) Deliver theory and practical activities to reinforce concepts. Relate to learning outcomes and objectives</td>
</tr>
<tr>
<td>b) Follow up with tutoring</td>
<td>To support students in their learning of new skills and methods by providing guidance and examples</td>
<td>Attending tutorial and presentation sessions throughout the module</td>
</tr>
</tbody>
</table>

### 4.2 Step 2 – Implement

At this step, intervention (action) and research activities related to data collection (practice-based, workshop, evaluation and feedback sessions) took place. The following sections report a narrated account of the action (who did what, when, where, how and why (Tripp, 2005). Data analysis and results are reported under Evaluation and Reflection steps.

#### 4.2.1 The workshop

The workshop was scheduled at the start of the ‘Define’ phase of the design process, once the students had received the brief, conducted some field observations and had been introduced to service design principles, process and commonly used methods and tools. The session was delivered to the students in a single day, and structured in three parts:

**Part 1 – Introduction**

*Contextualising* – First, the relevance and benefits of conducting cultural context research within their module project were introduced, placing the methodology within the context of Service Design for Social Innovation (Figure 5).
Then, semiotic and cultural analysis methods were introduced as ‘complementary’ to existing methods for user research (Figure 6). The benefits of both approaches were highlighted and differentiated: while traditional methods allow us to obtain information from users more ‘directly’ and understand them ‘on their own’ (behavioural aspects), semiotic methods were presented as an ‘indirect’ method for spotting unconscious meanings and cultural conventions which users cannot easily articulate – a way of understanding users ‘as social beings’.
Figure 6  *How semiotic methods compliment traditional user research.*

Theory was delivered in the context of Design for Services (Figure 7), and followed by group activities and discussions to consolidate knowledge.
Activity 1 – Deconstructing Cultural Artefacts
The first activity consisted of carrying out two analyses: First, students were asked to conduct a ‘cultural deconstruction’ of a **product** using the Circuit of Culture (du Gay et al., 2013) as a guide for analysis (Figure 8). Each group was assigned a product: the Dyson vacuum, the Mini Cooper and the Apple watch (Figure 9). The products selected represent good examples of design that changed a category’s meaning and achieved iconic status.
Following this, students were asked to repeat the analysis, but this time the ‘texts’ provided were service touchpoints for car sharing systems Drive Now and Co-Wheels (Figure 10).
Activity 2 – Innovation Feature Analysis

The second activity consisted in breaking down the service features into three main categories: Environmental, Functional and Symbolic features using an Innovation Feature Analysis template designed by the researcher (Figure 11). Two car sharing services were provided as cases for analysis (Drive Now, a private enterprise and Co-Wheels, a social enterprise).

### Innovation feature analysis

<table>
<thead>
<tr>
<th><strong>Environmental Features</strong></th>
<th>How is the innovation sustainable?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Functional Features</strong></th>
<th>What are the practical benefits that your innovation offers?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Saves money</td>
</tr>
<tr>
<td></td>
<td>Saves time</td>
</tr>
<tr>
<td></td>
<td>Is more convenient than existing options...</td>
</tr>
<tr>
<td></td>
<td>It works</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Symbolic Features</strong></th>
<th>What sort of symbolic associations should your innovation convey?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I feel connected</td>
</tr>
<tr>
<td></td>
<td>I feel important</td>
</tr>
<tr>
<td></td>
<td>I feel proud</td>
</tr>
<tr>
<td></td>
<td>I feel knowledgeable</td>
</tr>
<tr>
<td></td>
<td>I feel a hero</td>
</tr>
<tr>
<td></td>
<td>I feel a winner</td>
</tr>
<tr>
<td></td>
<td>I show that I care</td>
</tr>
<tr>
<td></td>
<td>It’s the cool thing to do</td>
</tr>
<tr>
<td></td>
<td>It’s fun</td>
</tr>
<tr>
<td></td>
<td>I feel important</td>
</tr>
<tr>
<td></td>
<td>I feel respected</td>
</tr>
<tr>
<td></td>
<td>I feel I stand out from the crowd</td>
</tr>
<tr>
<td></td>
<td>I feel worth it</td>
</tr>
<tr>
<td></td>
<td>It makes me happy</td>
</tr>
</tbody>
</table>

Figure 11 Feature analysis tool, provided to break down service features
For both activities students worked in small groups (Figure 12) and each activity was followed by open class discussion, to share and compare analysis results and reflect on what was being learned and why it was relevant to their projects.

Figure 12  Students engage in critical analysis activity

Part 2 – Methods and Tools for Context Mapping
Once students became familiar with the concept of the ‘cultural mediation of design’ the researcher could introduce basic semiotic theory concepts and applied semiotic methods and tools (Figure 13).
Figure 13  Sample slides for introducing applied semiotics concepts and theories
Part 3 – Context Mapping for Your Project

Here, students were introduced to a case study that illustrated how the methods and tools could support them throughout the design process during their projects, and were provided with some templates to encourage them to use the methods for their projects (Figures 14 and 15).

Figure 14  Tools for mapping trends and category analysis
As the templates were experimental and did not provide detailed instructions for use, students were reassured that they would be supported and guided with tutorial sessions to help them make the most of their learning using these tools.
The students were given recommendations for recording the use of the templates in their personal ‘log books’ (Figure 16). A list of key bibliography was also provided for further independent learning.

**What we expect you to do with your contextual map**

- You need to improve it as your research progresses
- Use Prezi.com or RealTimeBoard.com to create an online version so you can all share and contribute
- You need to refer to it during ideation & prototyping, to ensure that
  - your service offer (value proposition) is in line with the user’s values, aspirations and expectations.
  - your design representations (brand + touch points) speak the user’s ‘language’. If they don’t, they will be out their ‘radar’

**Remember to note in your log books when, how and why you are using these tools.**

*Figure 16  Recommendations and expectations for using the templates and building a contextual map*

**4.2.2 Follow up tutorial sessions**

As planned, students were supported throughout the eight weeks that followed. The group tutorial sessions provided tutors and students the opportunity to revisit the concepts, methods and tools delivered during the workshop (Figure 17).

*Figure 17  Group tutorial session*
Throughout these sessions, time was dedicated to each individual group to discuss progress, difficulties, ideas and provide guidance and support.

The researcher approached the group and asked a few generic questions to prompt conversations, took notes and offered guidance and advice as suitable. Within these discussions, certain specific methods and tools – either existing, or the researcher’s own – were recommended at different points of project development to support students with a specific problem or task (Figure 18).

![Figure 18 Student log book notes on tutorial feedback](image)

At Week 9 (end of Develop phase), it became apparent that the biggest problem most groups were facing was translating their service ‘descriptions’ into well-defined value propositions. To support the students overcome this barrier, the researcher developed a new aide (template) to help them crystalize their concept and formulate the value proposition more succinctly and accurately (Figure 19).
This tool was based on the ‘pains and gains’ existing method, which is widely implemented in user-centred research to analyse and describe customer experiences. To these two basic concepts, a third dimension was incorporated, to aid the definition and articulation of the value proposition as a coherent and relevant statement that synthesises the service into a sort of ‘elevator pitch’.

The intervention ended at Week 12 of the course, once the students delivered the project assignments.

4.3 Step 3 – Evaluate

In line with action research principles, the evaluation step consisted of an assessment of progress prompted from reflection on ‘change of practice’ (Kemmis & McTaggart, 2003). Progress – or research results – were evaluated by reflecting on how the research and action objectives agreed at the Planning (Step 1) were met.

The action objective for this intervention was to enable students with theories, methods and tools for researching and analysing the innovation’s context, and making sense of their findings. This objective was met by: 1. Introducing students to cultural analysis and semiotics theories in the context of Design for Social Innovation education; 2. Analysing how these were used, to better understand how they support the innovation process and contribute to build designers’ skills and capacity for socio-cultural context research, meaning-making and framing practices.
1. Dissemination of knowledge – how was it passed on and received?
Feedback on the workshop content, format and timing was collected by interviewing all student groups (4), two weeks after the workshop. The interviews revealed the following:

• Content and delivery format
In general terms, the workshop content was well received; students asked questions throughout the session, they were interested, engaged and participative.

‘I think I’d definitely encourage a lot more workshop content.’

However, most of them struggled with the activities which were hard for them to do by themselves, and needed the tutor’s support to further understand and elaborate. It was evident that most of them have never attempted this mode of analysis and were struggling to think critically and ‘denaturalise’ meanings.

‘Every time you come to our table were able to make sense of everything, yeah. We had make use of you coming to our table ... it helps a lot.’

‘I guess, to be honest, it was a bit confusing at first, maybe because we were sitting at the back, but ... overall I think the tools were quite useful...’

It must also be noted that the students that struggled the most with the ‘cultural deconstruction’ activities lacked the cultural background to interpret the meanings of the samples provided for analysis (e.g. Dyson vacuum and Mini Cooper car). The students that did have this cultural context information understood the activity more quickly and were better able to tackle the analysis without much help from the tutor.

• Timing
All theory, methods and tools were presented at once in the session, although it was assumed by the researcher that some of them would not appear relevant or useful at that point in the process. Students expressed:

‘I think that going back and revisiting once we have a stronger idea or direction will be very beneficial.’

Hence, as already planned, tutorial sessions provided opportunity to revisit concepts and support students with guidance as to which tools and methods could support them at different stages of the design process, why and how.

2. Use of knowledge – how did the tools and methods support students’ design process?
Students’ log books evidence differences in the use and internalisation of the methods and tools. Table 2 summarises the analysis showing which methods were used most and least (Frequency), how they were used (as a working or presenting tool), whether visual representations were employed (Visual Ref) and whether the tools were used in the format provided by the researcher or adapted by the students to suit (Fix or Adapted).
<table>
<thead>
<tr>
<th>ID</th>
<th>Method/Template</th>
<th>Frequency</th>
<th>How is it used?</th>
<th>Visual Ref</th>
<th>Fixed or adapted?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Global Trends Mapping</td>
<td>4</td>
<td>Both</td>
<td>1/4</td>
<td>Fixed</td>
</tr>
<tr>
<td>2</td>
<td>Global to Local Take</td>
<td>4</td>
<td>Both</td>
<td>1/4</td>
<td>Fixed</td>
</tr>
<tr>
<td>7</td>
<td>User Personas</td>
<td>4</td>
<td>Both</td>
<td>2</td>
<td>Both</td>
</tr>
<tr>
<td>8</td>
<td>Value Proposition Definition</td>
<td>4</td>
<td>Both</td>
<td>0</td>
<td>Both</td>
</tr>
<tr>
<td>9</td>
<td>Contextual Code Map</td>
<td>2</td>
<td>Both</td>
<td>2</td>
<td>Fixed</td>
</tr>
<tr>
<td>6</td>
<td>Exploring potential user groups (paradigm)</td>
<td>2</td>
<td>Both</td>
<td>1</td>
<td>Both</td>
</tr>
<tr>
<td>4</td>
<td>Market positioning (competitors)</td>
<td>1</td>
<td>Summary</td>
<td>1/4</td>
<td>Adapted</td>
</tr>
<tr>
<td>3</td>
<td>Offer definition (paradigm)</td>
<td>1</td>
<td>Process</td>
<td>0</td>
<td>Fixed</td>
</tr>
<tr>
<td>5</td>
<td>Category positioning</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>RDE (Residual, dominant and emergent meanings)</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

- Frequency

All groups used the ‘Global Trends Mapping’ and ‘Global to Local Take’ methods to summarise research around the ‘trends in tourism’ in contemporary society, and how that is manifested in the geographical context of innovation. These tools are well-suited to the late Discovery phase of the process, and supported students by structuring their exploration at these two levels, helping them to understand the general characteristics of the service category.

User personas and the Service Value Proposition methods were also used by all groups. These were strongly encouraged by tutors, as the relationship between them constitutes the foundational basis of user-centred innovation. The user personas were elaborated and represented differently, with various degrees of complexity between groups. The Value Proposition elaboration is discussed in more detail in the next section.

Some groups (2/4) used the Code Map and Category Positioning, while no groups used the RDE analysis, Offer Definition (binary oppositions) and Sub-category positioning. This was expected as, with exception of the Offer Definition, these are expected to support later stages of the process (Development and Delivery) touchpoint design, brand and communications development, which fall outside of the project scope for this assignment.
Figure 20  Poorly completed templates

Modes of use
While some students used the methods and templates as aides to focus and summarise their research activities throughout the process (Figure 21), others used them retrospectively to make sense of their development journey and communicating it to an audience (Figure 22). When used throughout the project, templates were annotated in written form or using sticky notes (Figure 21), visual representations of concepts were employed by those using them retrospectively.
Figure 21  Templates used as working tools

Two groups out of four used the templates in both ways (to aid the process and to summarise and present their findings). This demonstrates that some students (perhaps those who understood how to make best use of the methods) found them useful to structure their research phase, summarise their findings and present insights to others in a coherent, logical way. This, in turn, meant that because students were better equipped to correlate design decisions to the research data, they were also in a stronger position to argue in favour of their design proposals.
Figure 22 Global trends template used as visualisations
Impact over the value proposition

The ‘Discovery’ phase of the design process closes with a summary of insights upon which decisions are made to ‘Define’ a first concept and target users. This requires the translation of insights into clearly defined value propositions. Therefore, value proposition definition is a strong pre-requisite to progressing the service innovation onto the ‘Development’ phase.

In general terms, students had produced long, technical descriptions of the service that lacked emotional appeal and/or were not distinctive, or subtle enough to be differentiated from existing options.

At this point, the Service Value Proposition (SVP) tool was introduced (Figure 23), and all groups employed it to various degrees of success in delivering what was expected – i.e. succinct, clear and well-targeted statements (Figure 24).

Figure 23 Example of student’s use of the SVP tool
Defining value propositions is quite challenging for designers (Valencia, Mugge, Schoormans, & Schifferstein, 2015), and there seems to be a lack of tools and methods to support designers in this crucial task. The value of the methods to support value proposition framing was evidenced:

- It helped students research the context by providing a structure and strategy to organise design research
- Research findings were better articulated and more consciously linked to their design proposals
- The elaboration of value propositions was informed by a strong exploration of users and context, and understood as a clear output of the design process

### 3. Situating the activities within the ‘Double Diamond’ design process

Upon analysing how the students used the theory and practical methods provided by the researcher, the different activities proposed were situated within the innovation process as illustrated in Table 3.

---

**Table 3  Templates grouping according to design process stage**

<table>
<thead>
<tr>
<th>Purpose</th>
<th>ID</th>
<th>Method/Template</th>
<th>Value</th>
<th>Process stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>GLOBAL Innovation context exploration</td>
<td>1</td>
<td>Global Trends Mapping</td>
<td>Inform service offer</td>
<td>DEFINE</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Global to Local Take</td>
<td>Mapping cultural landscape, users (as social beings), competitors and allies to elaborate service positioning within context</td>
<td>Immerse in context</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Offer definition (paradigm)</td>
<td></td>
<td>Frame problem</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Market positioning (competitors)</td>
<td></td>
<td>Empathise</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Category positioning (themes)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Sub-category positioning</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Exploring potential user groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Service Value Proposition</td>
<td>Define offer</td>
<td>Value Proposition</td>
</tr>
<tr>
<td>LOCAL</td>
<td>7</td>
<td>Personas Lifestyle (visual mapping)</td>
<td>Inform design</td>
<td>DEVELOP</td>
</tr>
</tbody>
</table>

---

*The BUZZ is a monthly event that offers young adults who enjoy going out and socialising a totally new way to sample the products, service and heritage of Loughborough, creating an opportunity to come together under one roof to experience all that is unique about Loughborough's in a new and exciting way, that delivers a totally new experience that is like no other event of it's kind.*

**Figure 24  Formulated value proposition sample**
4.4 Step 4 – Reflect
In line with the research paradigm, a multi-perspective approach to reflection was adopted. Reflection was undertaken by researcher recording own accounts on both the action and the research, in order to learn from own practice by self-reflection (Schön, 1991). Opportunities were provided to gather participants’ reflections during and after the intervention.

Researchers’ reflections
The analysis of students’ log books and the researchers’ notes (taken throughout the tutorial sessions), revealed the following points:

- Students tend to jump to conclusions or ideas too early in the process, without a full understanding of the problems/situation they are trying to address
- Some might sit stubbornly with first concepts and avoid exploring beyond the obvious
- They face difficulties in structuring, analysing and drawing insights from research. In general terms, they:
  - Struggled and lacked methods to draw insights at a deeper level, and to summarise and cluster findings
  - They kept arriving at insights from the same (simplistic) angle, and avoided problematising. This is manifested as a repetition (going around in circles) in terms of insights, offer definition and user benefits, rather than progression of learning throughout the process that shows their expanding understanding.
  - Struggled to differentiate between user needs and service benefits

These points indicate that, in general terms, students find it difficult to grasp the workings of user-centred approaches to design. Therefore, mentoring and support throughout the process of ‘learning by doing’ is key for developing such capacity and skills. Time is short and it is necessary to develop educational activities which are more experiential, for students to grasp difficult concepts, given the time and information overload pressures. That left little opportunity to reflect and discuss social and sustainability aspects of the students’ proposals. In future, it could perhaps be beneficial to provide opportunities to analyse and discuss the outcomes as a group, to help build criticality and self-reflexion. For example, introducing a session post assessment to reflect together on outcomes and learning experience in relation to learning objectives could improve their own individual reflection and consolidate learning.
The discussions could reflect on how their service propositions contribute to societal sustainability and well-being, what values are legitimised and what assumptions of power relations are embedded in these concepts. The service Feature Analysis tool (Figure 15) used during the cultural decoding activities conducted in the workshop session could be a simple way to structure and prompt such discussions in the classroom.

**Students’ reflection**

- The knowledge was helpful approach to organise design research and make sense of findings

The content of the workshop appeared as new knowledge to most design students, who found the session helpful and illuminating, especially in terms of how to approach context exploration, organise research strategy and elaborate findings:

‘you taught us how to approach our research, and that is the important thing we learned in your workshop. Actually, for example how we can do analysis of our research and to express what we find.’

‘A framework ... to be able to explore.’

‘It’s a good way to help us organise our thoughts and generate ideas.’

This is further evidenced by the student’s use of the methods as discussed previously. Although the students were presented with many methods and tools alongside the ones provided by the researcher, they seem to have enjoyed being introduced to a wide, rather than little variety of them (Figure 25).

![Student's diary comment on tools](image)

**Figure 25 – Student’s diary comment on tools**

They also appreciated analysis methods in particular,

‘...there's not actually that much in the way of analysis methods and the more data we have, actually the more confusing it becomes.’
Some students’ diaries also show evidence of use of theoretical concepts explored during the workshop, e.g. to recall ‘Semiotic decoding’ to map contextual aesthetic codes (Figure 26).

Figure 26  Evidence of recalling knowledge disseminated at the workshop

**Tutors’ reflection**

The tutors welcomed the theories and methods introduced as valuable to build students’ critical and inquiring capacities and skills.

‘... what we’ve seen more distinctly is that they have been more critical about pinning down what the problem is, what the offerings are, etc.’ (C)

‘We need to reinforce somehow even more strongly to go out and look as you were saying to them: “You are designing into this context, this is the market, go there, take photos, you’re gonna report back with these next week”’ (V)

They also suggested to introduce the methods earlier in the course timetable the following year, which evidences their recognition of the value of this approach to structure and organise the design research stage.

‘[...] if we bring your methods earlier and maybe they do that with more time, and see whether we see more of an impact [on their outputs]’ (C)
The SVP definition was deemed one the most useful tools by tutor (V), who encouraged students to use it again for the same purpose, in a different course:

‘That tool [SVP] I pointed them to use it if for their major project because, they are following the double diamond framework, and then when they two of them overlap in the middle, there they should have a clear vision of who their target users are, what needs or what problems they have that could be met by your future service’ (V)

In summary, the tutor’s assessment was found consistent with students’ views and the researcher’s observations in that this approach helps to:

- Organise the design research phase, drawing and summarising insights, which contributes to build students’ critical and analytical skills and capacity
- Elaborate and define the value proposition by grounding it on strong insights

As discussed in section 2.3, these are critical capacities necessary to deal with meaning making and framing practices in design. Therefore, this intervention contributed towards bridging this gap.

5. Discussion and Conclusions

The research objective for this study was to expose students to cultural analysis and applied semiotics theories to deal with socio-cultural context research in the context of service design for social innovation.

By comparing data collected through three different methods (researcher notes, the students’ logbooks analysis and tutors’ feedback), it was found that the areas where students needed most support were:

1. Learning to immerse themselves in context, organise and analyse insights critically
   The results of this intervention confirm that students enjoy workshops and working with tools and templates, and these are deemed suitable to support the development of new skills and capacities while ‘learning by doing’. In this, the study highlighted the need to develop designers’ ability to recognise and use a wider variety of methods for design research, especially a better use of ethnography and other meaning-making and context situating methods that enable students to build empathy with users, and to ‘immerse’ in the context – e.g. by de-naturalising, strange-making, enacting and experiencing in order to elicit intangible aspects of user and context.

2. Being critical and questioning the literal, and their own assumptions throughout the process
   An important aspect highlighted by this study is the need to develop stronger capacity and methods for reflexivity and criticality, both of design practice and the consequences of design actions and outputs. Desirability of artefacts is an effect of meaning (Beckett, 2013), and is intrinsically linked to culture, values and their representation in social discourses. Introducing theories of cultural reproduction and ‘cultural deconstruction’ activities can prepare design students to understand the central role that design occupies, and consider the dimension in which design influences society by manipulating, reproducing and legitimising cultural meanings.
Framing and meaning-making imply the study of meaning, especially how meaning is formed and interpreted. Incorporating basic knowledge from cognitive science, semiotics and communication theories as a part of a designer’s education will prove invaluable in this regard. Whilst practical skills are, of course, vital to a designer’s education, it is also important that a design student gets an understanding of what design does and how it does it.

3. Defining service concepts into competitive, contextually relevant value propositions
Formulating value propositions and maintaining coherence of user experience is a challenging task for designers (Diehl & Christiaans, 2015; Valencia et al., 2014). The value proposition poses a bargaining scenario between two parts: providers who invite the users to take part in an exchange of value and benefits (Morelli, 2003).
Deconstructing and mapping the cultural landscape of the innovation can help designers to consider how the aesthetic, semantic and symbolic aspects influence and affect user’s interpretation of what the artefact is, how it should be used and what it says about the user. Design constraints can be drawn by producing a ‘map’ of stimuli that could help to anticipate, at least in part, user appeal and response, as well as keeping designers’ own preferences and tastes on check.

4. Making sense of what is being designed and for what purpose
The research also poses some interesting questions with regards to the ethics and design direction. The purposes for which design tools should be used – as with any form of knowledge – often rests on the moral values and ethical responsibilities upheld by practitioners. Design values are acquired and must be nurtured (Manzini, 2015). In this, it is responsibility of the educator not only to pass the knowledge, but provide guidelines for students to be self-reflective and critical about their own practice, and to find their own moral compass. For example, teaching the new knowledge generated by this research in the context of Service Design for Social Innovation reveals a clear intention from the educators.
To conclude, the aim of the investigation was to support designers to deal with socio-cultural and symbolic dimensions during the design process. This Action Research intervention investigated how the semiotic and cultural analysis theories and methods could support designers in this task. These initial results indicate that the methods provide good support for meaning-making aspects of innovation (generation of relevant value propositions and meaningful user experiences), and contribute to build criticality and reflexivity in designers’ research and practice.

5.1 Implications for Design Education
Designers equipped with traditional skills and training operate confidently in the technical and organisational dimensions of service design. Generally speaking, they find no problems in elaborating ‘tangible’ benefits for all stakeholders. However, traditional skills and capacities do not equip designers for the elaboration of meaning, or ‘intangible’ and socio-symbolic benefits – and these are key to align the service with context and users’ ideals of value, an aspect that is intrinsically linked to desirability.
It is evident that the canonical, linear, causal, and instrumental model is no longer adequate to describe the complexity of the design process. Consequently, the archetypical curriculum for design education (the three-part art/science/technology structure) needs to be updated. Findeli (2001) proposes a new model with a three-part structure that comprises perception (visual intelligence), action (a moral act) and aesthetics logic, arguing that visual intelligence, ethical sensibility and aesthetic intuition should be developed and strengthened throughout the whole course, forming the ‘basics’ of design education.

Congruently, the implementation of the socio-cultural lens suggested in this study contributes to the development of such skills, awareness and capacities in students in the following:

- Understanding that the primary object of design in service innovation is concerned with meaning- and sense-making, the result of which is the interplay of organisational, technical and socio-symbolic dimensions.
- Meaning-making is an intrinsic activity in sustainable service design that makes use of cultural resources. Critical analysis methods such as the ones used in this study offer a good basis to tackle these aspects more methodically, and it ready to be applied within existing design research and service design process.
- Cultural deconstruction activities and methods support the development of critical and analytical capacity, as well as ‘cultural literacy’ through deconstruction of cultural myths, preconceptions. This raises designers, awareness of the influence their output bears in culture, as well as the factors that drive their own design practice and activity.

5.2 Limitations and recommendations for further research
The application of this socio-cultural lens in the design process evidenced the strength of applied semiotics to aid in structuring design research, and prompting students to note global and local trends, cultural myths, and mapping social signifiers. However, it is difficult to determine precisely how the intervention alone influenced the design and value proposition outputs, given that students used this knowledge in combination with other tools and methods. Time assigned to activities also posed a challenging limitation to the quality of results that can be obtained through this type of analysis. Although applied semiotics methods show a promising approach to support the development of meaning making capacities in students, results are bound to a single case study and further iterations in other education contexts (e.g. other universities, related discipline students) are required to assert value in this respect.

The templates developed by the researcher to support the implementation of the cultural analysis activities helped to spark discussions, structure exploration and summarise findings. However, these materials were experimental and would benefit from further development to make them fit for stand-alone use (e.g. develop a framework/toolkit with instructions). Todays’ fast-paced education environment requires imaginative and experiential ways to deliver ‘hard to grasp’ theories and concepts such as semiotics. In this respect, the materials would benefit from further development aiming to create more immersive, performative and empathic learning experiences.
References


Evans, M., & Shivakumar, H. (2010). Insight, cultural diversity, revolutionary change: Joined up semiotic thinking for developing markets. In ESOMAR.


About the Authors

**Laura Santamaria** is PhD researcher. Her research interest includes sustainable lifestyles and consumption, social entrepreneurship, sustainable fashion, branding and visual culture, product/service innovation, user experience, cultural heritage and craft practices, forecasting, media, communication, semiotics and cultural theory.

**Carolina Escobar-Tello** is lecturer on Industrial/Product Design. Her key areas of expertise include design for happiness, sustainable product service systems, social innovation, sustainable societies and lifestyles, systemic thinking, industrial design, creative design methods.

**Tracy Ross** is Associate Dean. Her expertise is in the user-centred design of technology-related innovation. Her research experience crosses several application domains but with a particular focus on transport, mobile and social systems.

**Erik Bohemia** is Programme Director in Institute for Design Innovation. Erik is interested in Design as cultural practice and the material effects of design. He is currently researching the construction of the user and how this guides the design process.
This page is intentionally left blank.
Author Index

AFTAB Mersha, 889, 931
AINAMO Antti, 987
AMANO Tsuyoshi, 1187
AVILA-MORENO Monica, 73
BADJOKO Baydhir, 161
BADKE-SCHAUB Petra, 1539
BAKKER-WU Sijia, 1213
BECK Caroline, 1061
BEKKER Tilde, 451
BEST Kathryn, 261
BOHEMIA Erik, vii, 127, 649, 695, 1759
BORJA DE MOZOTA Brigitte, 1391, 1439
BRANKAERT R.G.A., 767
BRASSETT Jamie, 1187
BUCOLO Sam, 1111
BUHRING Jorn, 1111
BUHRING Jorn H, 1115
CAI Jun, 381
CALABRETTA Giulia, 983, 1061, 1213
CANIK Yasemin, 127
CARRO SAAVEDRA Cristina, 1393, 1457
CAUTELA Cabirio, 19
CELHAY Franck, 1247
Chang Tsai Ping, 675
CHANG, Kuo-pin, 91
Chen, Li-Hao, 179
Cheng Pei-Jung, 675
CHENG Peiyao, 1079
CHOO Youngok, 359
CHOO Youngeun, 359
CHRISTIAANS Henri, 1533
CHUAI Ying, 1493
CLARK Mark A, 1489
COMI Alice, 1489
CORENO Victó, 711
COULSON Saskia, 1149, 1513
DE BONT Cees, vii, 867, 1079
DE LILLE Christine, 1043, 1061, 1287
DE MORAES Dijon, 819
DE VERE Ian, 359
DEKEN Fleur, 983
DELL’ ACQUA BELAVITIS Arturo, 1563
DELL’ERA Claudio, 19, 43
DEMIR Özümcan, 1595, 1685
DESHMUKH Sandeep, 161
DESMET Pieter, 1539
DEWIT Ivo, 471
DHILLON Yasmin Sekhon, 207
DOMINGUES Felipe, 819
DORKST Kees, 1287
EISENBART Boris, 23
EL HILALI Nabil, 277
ENNIS Caroline, 1343
ENSOR John, 1209
ER Özlem, 1019
ESCOBAR-TELLO Carolina, 1759
Eszter VASS, 869
FAIN Nuša, 109, 147
FAN Yi, 1291
FEI Fan, 1489
FENN Terence, 1667
FITZGERALD Robert, 1613
FORD Peter, 325, 1703
FU Jia, 113
Gabor HORVATH, 869
GAL Xiang, 1493
GARBUJO Massimo, 23
GEMSER Gerda, 983, 1003
Gloria Anne MOSS, 869
GLORIA Moss, 867
GONÇALVES Milene, 1539
Gong Jingsi, 595
GOTO Satoru, 433
GRAFF Daniel, 1489
GREEN Lawrence, 1187
GRIFFITH Selena, 1533
GUANZHONG Liu, 509
GÜNGÖR BONCUKÇU İtrir, 1685
Erik Bohemia is the Programme Director in the Institute for Design Innovation at Loughborough University London. He is interested in Design as a cultural practice and the material effects of design.

Cees de Bont is dean of School of Design, Hong Kong Polytechnic University. His research interests are in the areas of early concept testing of consumer acceptance, branding, networked innovation and design education.

Lisbeth Svengren Holm is professor in Design Management at Gothenburg University, Director of Business & Design Lab. Her research interests include design management, design & strategy, design & innovation, and the interaction between design and other functions.